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Service & Solutions

Satellites set for launch for Africa and North America

Arianespace's sixth launch of 2007 will orbit two telecommunications satellites: RASCOM-QAF1, built by Thales Alenia Space for RascomStar-QAF, the Regional African Satellite Communication Organization and Horizons-2, built by Orbital Sciences Corporation for Horizons 2 Satellite LLC, a joint venture between Intelsat and JSAT.

By choosing Arianespace, these major satellite manufacturers and space communications operators confirm the space transportation company's international reputation for superior launch service quality. Ariane 5 is the only commercial launcher in service today capable of launching two payloads at the same time.

Arianespace is especially proud to be launching Rascom-QAF1, the first Pan-African satellite. Thanks to Rascom-QAF1, RascomStar-QAF will be able to provide a range of telecommunications services for the entire African continent.

Built by Thales Alenia Space under a turnkey contract from RascomStar-QAF, the Rascom-QAF1 satellite has a design operational lifetime of 15 years, during which it will provide telecommunications services to rural areas, as well as intercity and international phone links, plus direct TV and Internet access service. Based on a Spacebus 4000 B3 platform, this powerful spacecraft carries 12 Ku-band transponders and eight C-brand transponders. It will weigh about 3,200 kg at launch and have a 6.4 kW power end of life. The satellite will be positioned at 2.85 degrees East.

Intelsat and JSAT Corporation enjoy a longstanding relationship with Arianespace anchored in confidence. This is the third satellite Arianespace has launched for Intelsat in 2007. Since 1983, Arianespace has launched 47 satellites for Intelsat, plus six satellites for the Japanese operator since 1989.

Weighing approximately 2,300 kg at liftoff, the Horizons-2 satellite was built by Orbital Sciences on its STAR satellite platform. It carries 20 high-power Ku-band transponders and will generate 3.5 kilowatts of payload power. From its geostationary orbit, Horizons-2 will provide occasional use video and IP-based content distribution for the continental United States, the Caribbean and parts of Canada. Likewise, Horizons-2 will support a number of comms-on-the-move applications for government customers. Its unique boomerang beam will support littoral water operations off the U.S. eastern seaboard for homeland security, ship-to-shore communications and cargo tracking. Horizons-2, which has a 15-year design life, will occupy Intelsat's orbital slot at 74 degrees West.

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

1. Mission profile

This 180th Ariane launch will loft two telecommunications satellite into orbit: Rascom-QAF1, built by Thales Alenia Space for Pan-African operator RascomStar-QAF, and Horizons-2, built by Orbital Sciences Corporation for operator Horizons 2 Satellite LLC, a joint venture of Intelsat and JSAT.

This will be the 36th launch an Ariane 5 heavy-lift vehicle.

The launcher will be carrying a total payload of 6 185 kg, including 5 464 kg, for the satellites, which will be released separately into their respective orbits.

The launch will be from Ariane Launch Complex No. 3 (ELA-3) in Kourou, French Guiana.

Injection orbit

Perigee altitude	***585 km***
Apogee altitude	***35 866 km at injection***
Inclination	***5,5° degrees***

The lift-off is scheduled on the night of 20 to 21 December, 2007 as soon as possible within the following launch window:

Launch opportunity

	Universal time (GMT)	*Paris time*	*Washington time*	*Kourou time*	*Tokyo time*
Between	*9:14 pm*	*10:14 pm*	*4:14 pm*	*6:14 pm*	*6:14 am*
and	*9:58 pm*	*10:58 am*	*4:58 pm*	*6:58 pm*	*6:58 am*
on	*December 20, 2007*	*December 20, 2007*	*December 20, 2007*	*December 20, 2007*	*December 21, 2007*

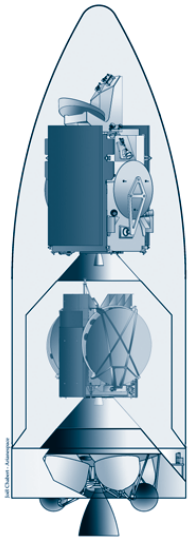
Configuration of Ariane payload

The RASCOM-QAF1 satellite was built by Thales Alenia Space in Cannes for Pan-African operator RascomStar-QAF.

Orbital position: 2.85 degrees East.

The Horizons-2 satellite was built by Orbital Sciences Corporation in Dulles, Virginia, (United States) for operator Horizons 2 Satellite LLC.

Orbital position: 74 degrees West.



2. Range operations campaign: ARIANE 5 - RASCOM-QAF1/HORIZONS-2

Satellites and launch vehicle campaign calendar

Ariane activities	*Dates*	*Satellites activities*
Campaign start review	*October 26, 2007*	
EPC Erection	*October 26, 2007*	
EAP transfer and positionning	*October 29, 2007*	
Integration EPC/EAP	*October 30, 2007*	
	November 2, 2007	*Arrival in Kourou and begining of RASCOM-QAF1 preparation campaign in building S1 B*
EPS Erection	*November 5, 2007*	
Integration equipement bay	*November 5, 2007*	
	November 21, 2007	*Arrival in Kourou and begining of HORIZONS-2 preparation campaign in building S1 B*
Roll-out from BIL to BAF	*November 29, 2007*	
	Nov 30-Dec 3, 2007	*RASCOM-QAF1 filling operations in S5 B building*
	December 3-5, 2007	*HORIZONS-2 filling operations in S5 A building*

Satellites and launch vehicle campaign final calendar

Wednesday, December 5		*RASCOM-QAF1 integration on adaptor (ACU)*
Thursday, December 6		*RASCOM-QAF1 transfer to Final Assembly Building (BAF)*
Friday, December 7		*RASCOM-QAF1 integration on Sylda, HORIZONS-2 integration on adaptor*
Saturday, December 8		*Fairing integration on Sylda - HORIZONS-2 transfer to Final Assembly Building (BAF)*
Monday, December 10		*HORIZONS-2 integration on launcher*
Tuesday, December 11		*Upper composite integration with RASCOM-QAF1 on launcher*
Wednesday, December 12		*Preparations EPS and SCA for filling*
Thursday, December 13		*Filling of SCA*
Friday, December 14		*EPS filling with MMH - Launch rehearsal*
Saturday, December 15		*EPS filling with N2O4*
Monday, December 17		*Arming of launch vehicle*
Tuesday, December 18		*Launch readiness review (RAL) and final preparation of launcher, payloads control*
Wednesday, December 19	*J-1*	*Roll-out from BAF to Launch Area (ZL), launch vehicle connections and filling of the EPC liquid Helium sphere*
Thursday, December 20	*J-0*	*Launch countdown including EPC 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 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.

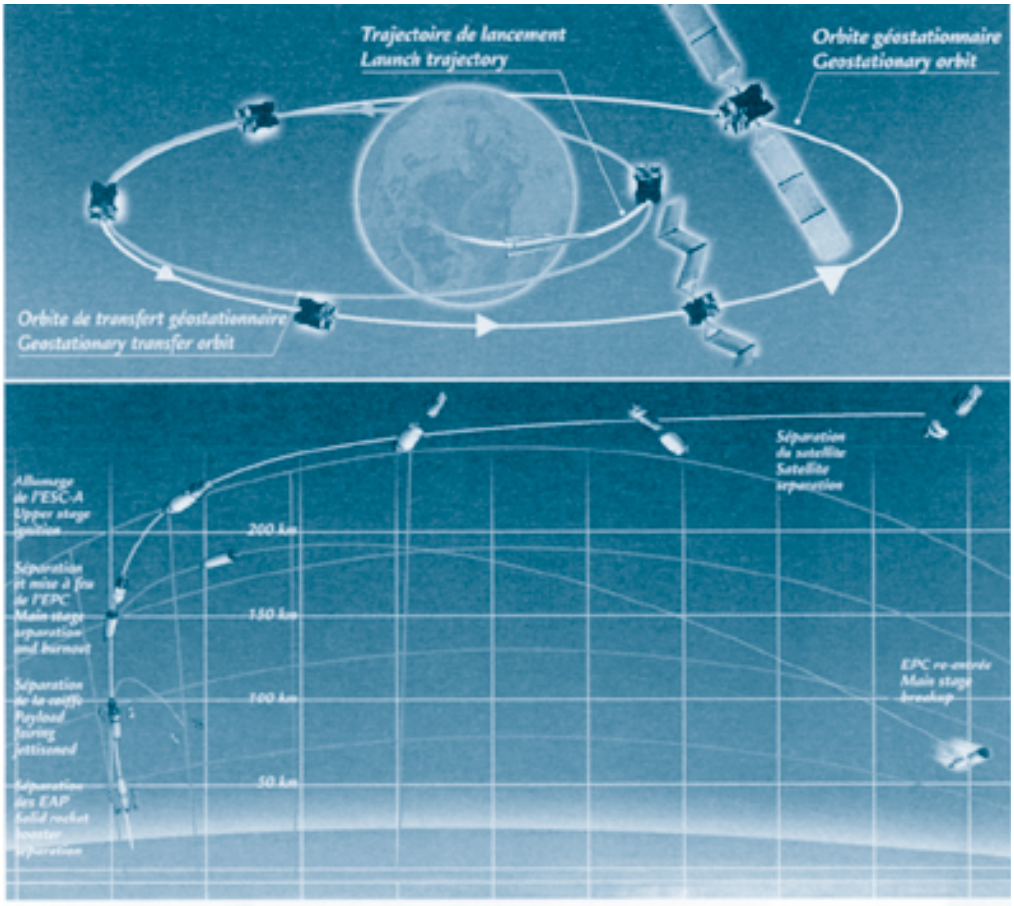
Time		*Events*
– 11 h	*30 mn*	*Start of final countdown*
– 7 h	*30 mn*	*Check of electrical systems*
– 4 h	*50 mn*	*Start of filling of main cryogenic stage with liquid oxygen and hydrogen*
– 3 h	*20 mn*	*Chilldown of Vulcain main stage engine*
– 1 h	*10 mn*	*Check of connections between launcher and 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*
	+ 12,5 s	*End of vertical climb and beginning of pitch rotation (10 seconds duration)*	*0.095*	*40*
	+ 17 s	*Beginning of roll manoeuvre*	*0.361*	*79*
+ 2 mn	*20 s*	*Jettisoning of solid boosters*	*65.5*	*2132*
+ 3 mn	*20 s*	*Jettisoning of fairing*	*106.6*	*2412*
+ 8 mn	*22 s*	*Acquisition by Natal tracking station*	*131.6*	*5835*
+ 9 mn	*42 s*	*Shut-down of main cryogenic stage*	*142.9*	*7714*
+ 9 mn	*48 s*	*Separation of main cryogenic stage*	*145.9*	*7732*
+ 9 mn	*55 s*	*Ignition of storable propellant stage (EPS)*	*149.3*	*7728*
+ 12 mn	*21 s*	*Acquisition by Ascension tracking station*	*235.2*	*7883*
+ 26 mn	*30 s*	*Shut-down of EPS / Injection*	*1602.7*	*8602*
+ 28 mn	*30 s*	*Separation of RASCOM-QAF1satellite*	*1977.0*	*8339*
+ 30 mn	*40 s*	*Separation of Sylda 5*	*2424.8*	*8046*
+ 32 mn	*30 s*	*Separation of HORIZONS-2 satellite*	*2819.2*	*7803*
+ 40 mn	*30 s*	*End of Arianespace Flight mission*	*4197.3*	*7047*

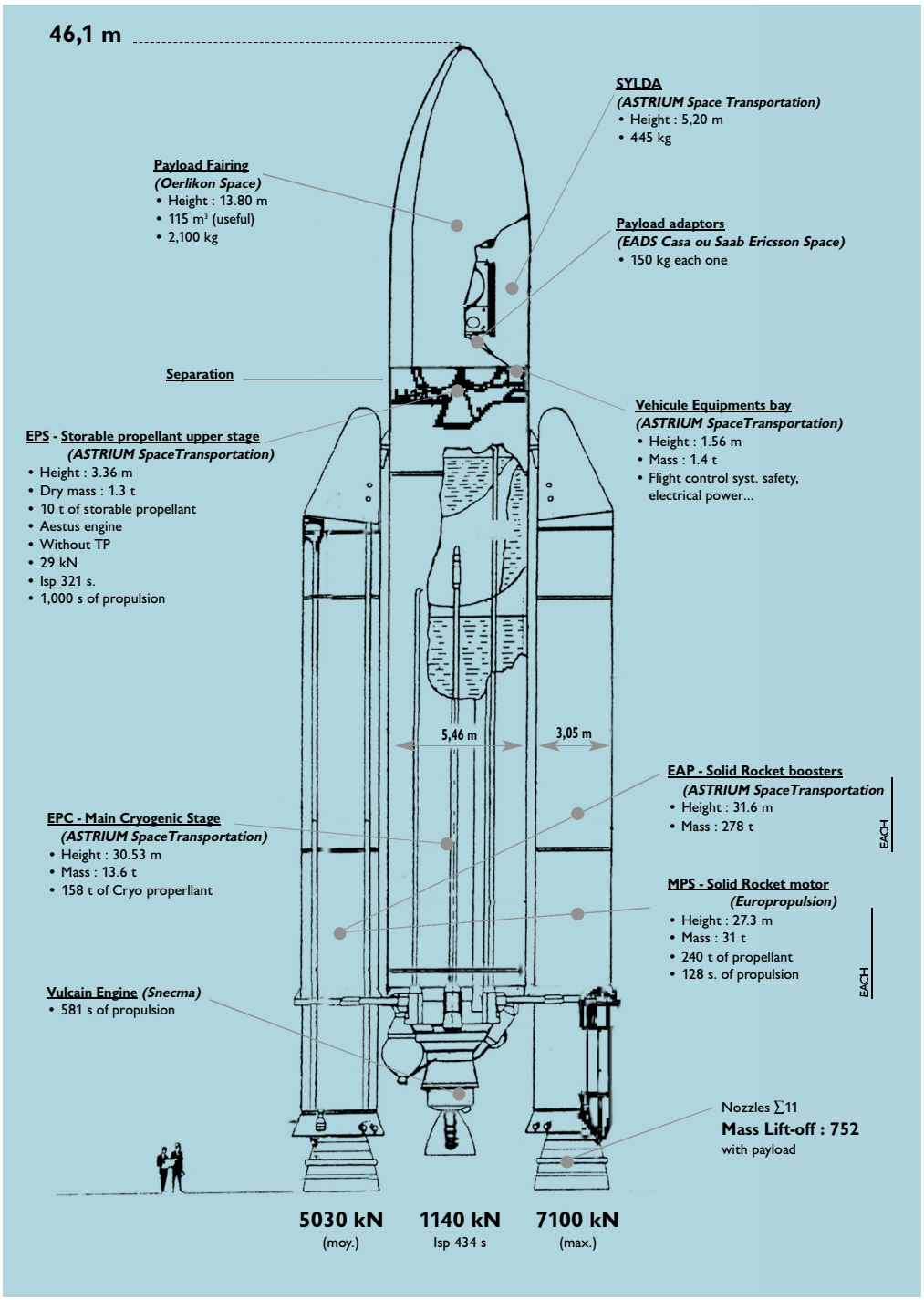
4. Flight trajectory

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 computers optimize 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 storable propella 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 8602 meters/second, and will be at an altitude of about 1602 kilometers.
The fairing protecting the RASCOM-QAF1/HORIZONS-2 spacecraft is jettisoned shortly after the boosters are jettisoned at about T+200 seconds.

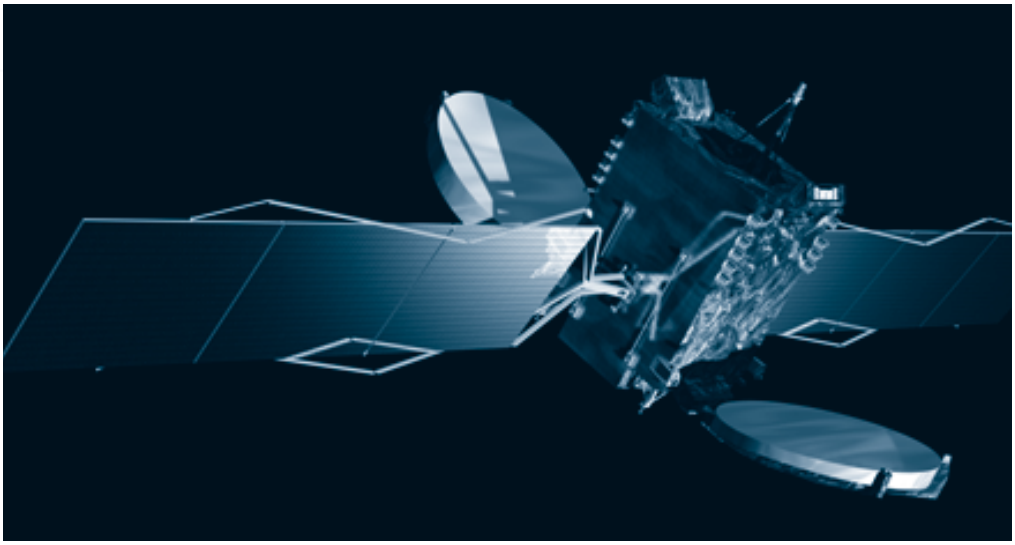
Standard Ariane 5 trajectory for geostationary transfer orbit



5. The Ariane 5GS (Industrial prime cartractor: ASTRIUM Space Transportation)



6. The RASCOM-QAF1 satellite



Customer	**Thales Alenia Space for RascomStar-QAF**	
Prime contractor	*Thales Alenia Space*	
Mission	*Rural telephony, data transmission, Internet and Direct Television*	
Mass	*Total mass at lift-off*	*3 160 kg*
	Dry mass	*1 395 kg*
Stabilization	*3 axis stabilized*	
Dimensions	*3.75 x 2.36 x 1.80 m*	
Span in orbit	*31.8 m*	
Platform	*Spacebus 4000 B3*	
Payload	*8 C band transponders, 12 Ku band transponders*	
On-board power	*6 400 W (end of life)*	
Life time	*15 years*	
Orbital position	*2.85° East*	
Coverage area	*Africa*	

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7. The HORIZONS-2 satellite

Customer	**HORIZONS 2 SATELLITE LLC (INTELSAT/JSAT)**	
Prime contractor	*Orbital Sciences Corporation*	
Mission	*Data transmissions, government and occasional use video services*	
Mass total	*mass at lift-off*	*2 304 kg*
Stabilization	*3 axis stabilized*	
Dimensions	*4.0 x 3.3 x 2.3 m*	
Span in orbit	*18 m*	
Platform	*STAR 2*	
Payload	*20 Ku band transponders*	
On-board power	*4 400 W (end of life)*	
Life time	*15 years*	
Orbital position	*74° West*	
Coverage area	*The Continental United States, Caribbean and parts of Canada*	

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Appendix 1. Arianespace RASCOM-QAF1 & HORIZONS-2 launch key personnel

In charge of the launch campaign			
Mission Director	*(CM)*	*Jean-Marc DURAND*	*ARIANESPACE*
In charge of the launch service contract			
Ariane Payload Manager	*(RCUA)*	*Caroline ARNOUX*	*ARIANESPACE*
Ariane Deputy Mission Manager	*(RCUA/A)*	*Luca CHIECCHIO*	*ARIANESPACE*
In charge of* RASCOM-QAF1 *satellite			
Satellite Mission Director	*(DMS)*	*Guy BURLE*	*THALES ALENIA SPACE*
Satellite Program Manager	*(CPS)*	*Alain PLANAS*	*THALES ALENIA SPACE*
Satellite Preparation Manager	*(RPS)*	*Pierre-Jean MONICAT*	*THALES ALENIA SPACE*
In charge of* HORIZONS-2 *satellite			
Satellite Mission Director	*(DMS)*	*Brian SING*	*INTELSAT*
Satellite Program Manager	*(CPS)*	*Marcy TAYLOR*	*ORBITAL*
Satellite Preparation Manager	*(RPS)*	*Mike KOENIG*	*ORBITAL*
In charge of the launch vehicle			
Launch Site Operations Manager	*(COEL)*	*Patrick LUCET*	*ARIANESPACE*
Ariane Production Project Manager	*(CPAP)*	*Olivier RICOUART*	*ARIANESPACE*
In charge of the Guiana Space Center (CSG)			
Range Operations Manager	*(DDO)*	*Bruno GILLES*	*CNES/CSG*
Range Operations Deputy	*(DDO/A)*	*Jacques SCHRIVE*	*CNES/CSG*

Appendix 2. Launch environment conditions

Acceptable wind speed limits at lift-off 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 20,000 m) is also taken into account.

Appendix 3. The synchronized sequence

The synchronized sequence starts 7 mn beforre 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 reduntant 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 and perform associated checks. In addition, 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 the Vulcain engine in the jet guide (T-18 sec).
- Burnoff of hydrogen used for chilldown (T-5.5 sec).

At T-4 seconds, the onboard computer takes over control of final engine startup and lift-off operations:

- 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 lift-off 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.

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Appendix 4. Arianespace and the Guiana Space Center

Arianespace was founded in 1980 as the world's first launch Service & Solutions company. Today, Arianespace has 23 shareholders from ten European countries (including French space agency CNES with 34%, EADS with 30%, and all European companies participating in the construction of Ariane launchers).
Since the outset, Arianespace has signed more than 290 launch contracts and launched 252 satellites. More than two-thirds of the commercial satellites now in service worldwide were launched by Arianespace.
The company posted sales of 983 million euros in 2006, and stayed in the black for the fourth year in a row.
At January 1, 2007, Arianespace had 271 employees, working at the company's headquarters in Evry (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 Service & Solutions to satellite operators from around the world, including private companies and government agencies. These Service & Solutions call on three launch vehicles:
- The Ariane 5 heavy launcher, operated from the Guiana Space Center in Kourou, French Guiana.
- The Soyuz medium launcher. Currently in operation at the Baikonur Cosmodrome in Kazakhstan under the responsibility of Starsem, a Euro-Russian subsidiary of Arianespace, it will be launched from the Guiana Space Center starting in 2009.
- The Vega light launcher, to be launched from the Guiana Space Center starting in 2009.

Arianespace has also signed a mutual backup agreement with Boeing Launch Services and Mitsubishi Heavy Industries, through an entity called the Launch Services Alliance. This arrangement guarantees that customers' payloads will be launched in case the chosen launcher is unavailable for technical reasons.
With its family of launchers and this backup agreement, Arianespace won over half of the commercial launch contracts up for bid worldwide in the last two years. Arianespace now has a backlog of about 50 satellites to be launched, as well as three more launches to be handled by Starsem. .

The Guiana Space Center: Europe's Spaceport
For over 30 years, the Guiana Space Center (CSG), Europe's Spaceport in French Guiana, has offered a complete array of facilities for rocket launches.
It mainly comprises the following:
- CNES/CSG technical center, including various resources and facilities that are critical to launch bas operation, such as radars, telecom network, weather station, receiving sites for launcher telemetry, etc.
- Payload processing facilities (ECPU), in particular the S5 facility.
- Ariane launch complexes (ELA), comprising the launch zone and launcher integration buildings.
- Various industrial facilities, including those operated by Regulus, Europropulsion, Air Liquide Spacial Guyane and EADS, which contribute to the production of Ariane 5 elements. A total of 40 European manufacturers and local companies are involved in operations.

The Guiana Space Center is preparing to welcome two new launch vehicles, Soyuz and Vega. The Soyuz launch complex (ELS) and the Vega launch complex (SLV) are now under construction.
Europe's commitment to independent access to space is based on actions by three key players: the European Space Agency (ESA), French space agency CNES and Arianespace.
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 French space program, the Guiana Space Center has gradually become 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 CNES/CSG fixed expenses, and also helps finance the fixed costs for the ELA launch complexes.
French space agency CNES plays several roles at the Space Center.
- It designs all infrastructures and, on behalf of the French government, is responsible for safety and security.
- It provides the resources needed to prepare the satellites and launcher for missions.

Whether during tests or actual launches, CNES is also responsible for overall coordination of operations. It collects and processes all data transmitted from the launcher via a network of receiving stations, to track Ariane rockets throughout their trajectory.
In French Guiana, Arianespace is the contracting authority in charge of operating the family of three launchers, Ariane, Soyuz and Vega.
Arianespace supervises the integration and functional checks of the Ariane launcher, built by EADS Astrium as production prime contractor, in the Launcher Integration Building (BIL). It then carries out acceptance tests of the launcher at the same time as satellite preparations in the Payload Preparation Complex (EPCU), operated by the Guiana Space Center (CSG). Arianespace next oversees final assembly of the launcher and integration of satellites in the Final Assembly Building (BAF), followed by transfer of the launcher to Launch Zone No. 3 (ZL3), and then final countdown and liftoff from Launch Complex No. 3 (CDL3).
Arianespace has created a top-flight team and array of technical resources to get launchers and satellites 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.