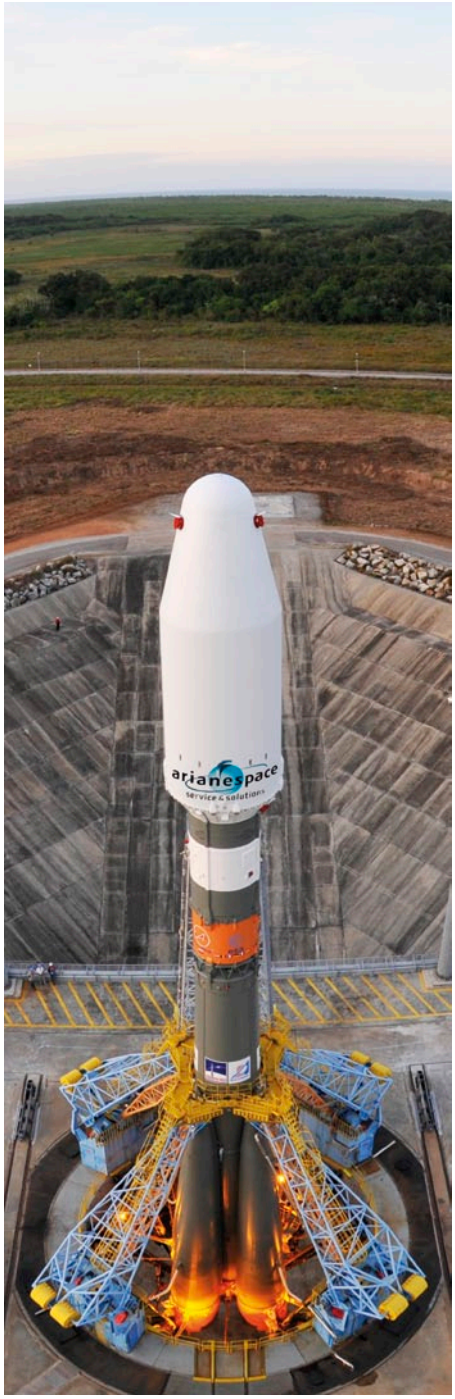
GAIA LAUNCH

Arianespace's sixth Soyuz launch from the Guiana Space Center will carry the Gaia space telescope into orbit. The European Space Agency (ESA) chose Astrium as prime contractor to develop and build the satellite.



With the Soyuz, Ariane 5 and Vega launchers fully operational from the Guiana Space Center (CSG), Arianespace is the only launch services provider in the world capable of launching all types of payloads into all orbits, from the smallest to the largest geostationary satellites, from satellite clusters for constellations to cargo missions for the International Space Station (ISS).

Arianespace sets the launch services standard for all operators, whether commercial or governmental, and guarantees access to space for scientific missions.

Gaia, the 25th scientific satellite launched by Arianespace, is a dedicated cosmology spacecraft.

ESA's Gaia mission will map the stars in order to understand the origins, structure and evolution of our Galaxy, the Milky Way.

Gaia will create a map of more than a billion stars, equal to about 1% of all the stars in our Galaxy. Gaia should also discover a large number of other celestial objects, including new asteroids, newly formed stars, distant stellar explosions and giant black holes.

Gaia will be positioned some 1.5 million kilometers from Earth in a Lissajous orbit around the second Lagrange point, L2.

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MISSION DESCRIPTION

The sixth Soyuz launch from the Guiana Space Center (CSG) will send the Gaia satellite towards the second Lagrange point, L2, about 1.5 million kilometers from the Earth. One of the main advantages of this orbit is that is offers a stable thermal environment. It will be placed into a Lissajous type orbit to avoid solar and terrestrial eclipses.
The launcher will be carrying a total payload of 2,105 kg including 2,034 kg for the Gaia satellite to be released into its targeted orbit.
The launch will be from the Soyuz Launch Complex (ELS) in Sinnamary, French Guiana.

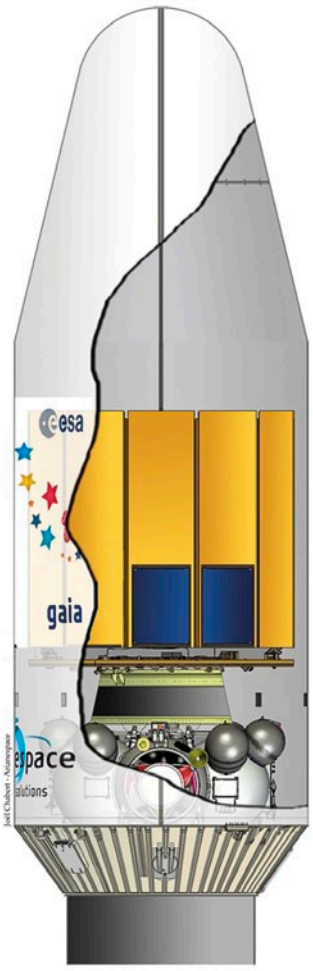
Targeted orbit elliptical
Apogee : 952,022 km
Perigee : 6,722 km
Inclination : 14.98 degres

Liftoff is scheduled for **Thursday, December 19, 2013** at precisely:

6:12:19 am	(Heure de Guyane)
4:12:19 am	(Heure de Washington, DC)
9:12:19 am	(UTC)
10:12:19 am	(Heure de Paris)
1:12:19 pm	(Heure de Moscou)

The launch at a glance

Following liftoff from the Guiana Space Center, the powered phase of the lower three Soyuz stages will last about nine minutes. The upper composite, comprising the Fregat upper stage and the Gaia satellite with its adaptor, will then be separated from the third stage of the launcher. The three lower stages will fall back into the sea.



The Fregat upper stage will then carry out two powered phases:

- First burn, lasting 2 minutes and 16 seconds , followed by a ballistic phase lasting slightly less than 9 minutes.
- Second burn, lasting 15 minutes and 34 seconds, followed by a second ballistic phase, lasting 5 minutes, prior to satellite release.

The Gaia satellite will be released 41 minutes and 59 seconds after liftoff.

A third and last burn of the Fregat stage, 58 minutes and 20 seconds after liftoff, will place this stage into a graveyard orbit.

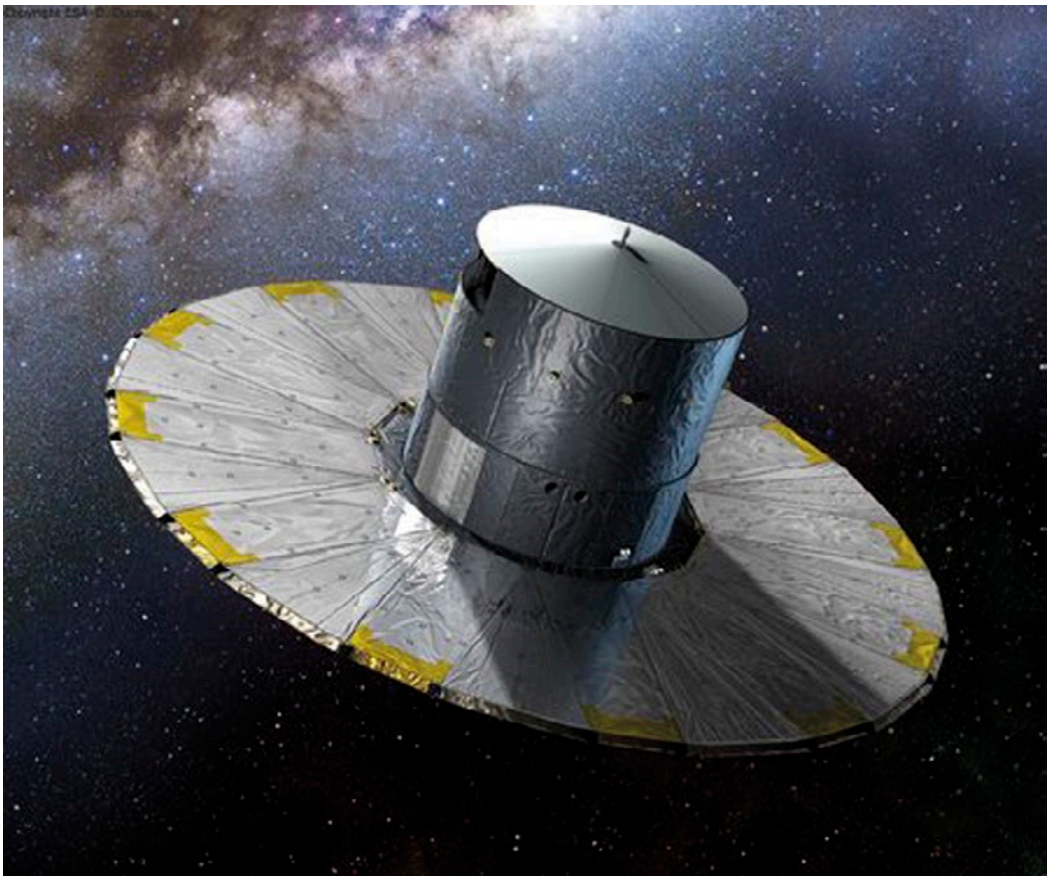
Mission length

The nominal length of the mission, from liftoff to satellite release, is 41 minutes and 59 seconds.

Soyuz payload

The Gaia satellite was designed, tested and integrated by Astrium for The European Space Agency (ESA).

GAIA SATELLITE



Customer	ESA – European Space Agency
Mission	Mapping of the Milky Way
Manufacturer	EADS Astrium
Orbit	Lissajous orbit (15°) around Lagrange point L2
Instruments	1 astrometric instrument, 1 photometric instrument and
1 radial velocity spectrometer	Diamètre de 3,8m pour une Hauteur de 4,4m
Dimensions	3.8m diameter – 4.4m height
Mass	Total mass at liftoff 2,034 kg
Design life	5.5 years
Electrical power	2,300W (beginning of life)
Stabilization	3 axis

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SOYUZ LAUNCH VEHICLE

The Soyuz launch vehicle family has provided reliable and efficient launch services since the start of space exploration. Soyuz rockets, which launched both the first artificial satellite and the first man into space, have been credited with more than 1,800 launches to date. Today, Soyuz is used for manned and unmanned flights to the International Space Station, as well as commercial launches.

The Soyuz configuration introduced in 1966 has been the workhorse of the Soviet/Russian space program. As the only manned launch vehicle in Russia and the former Soviet Union, Soyuz meets very high standards of reliability and robustness.

In 1999, Arianespace's affiliate Starsem used Soyuz to launch the 24 satellites in the Globalstar constellation, in six launches. Following this success, Starsem introduced the restartable Fregat upper stage, which offered the operational flexibility that paved the way for a full range of missions (LEO, SSO, MEO, GTO, GEO and escape).

The first launch of the Soyuz 2-1a version on November 8, 2004 from the Plessetsk Cosmodrome represented a major step in the launch vehicle development program. This modernized version of Soyuz, also used to successfully launch MetOp-A on October 19, 2006, features a digital control system providing additional mission flexibility; it also enables control of the launch vehicle fitted with the 4. 1-meter ST fairing. This was a necessary step towards the next-generation Soyuz 2-1b launcher, the culmination of a joint European/Russian upgrade program. It adds a more powerful third-stage engine, significantly increasing the launcher's overall performance.

The inaugural flight of the upgraded Soyuz 2-1b launch vehicle was successfully performed on December 27, 2006, orbiting the Corot scientific spacecraft for French space agency CNES.

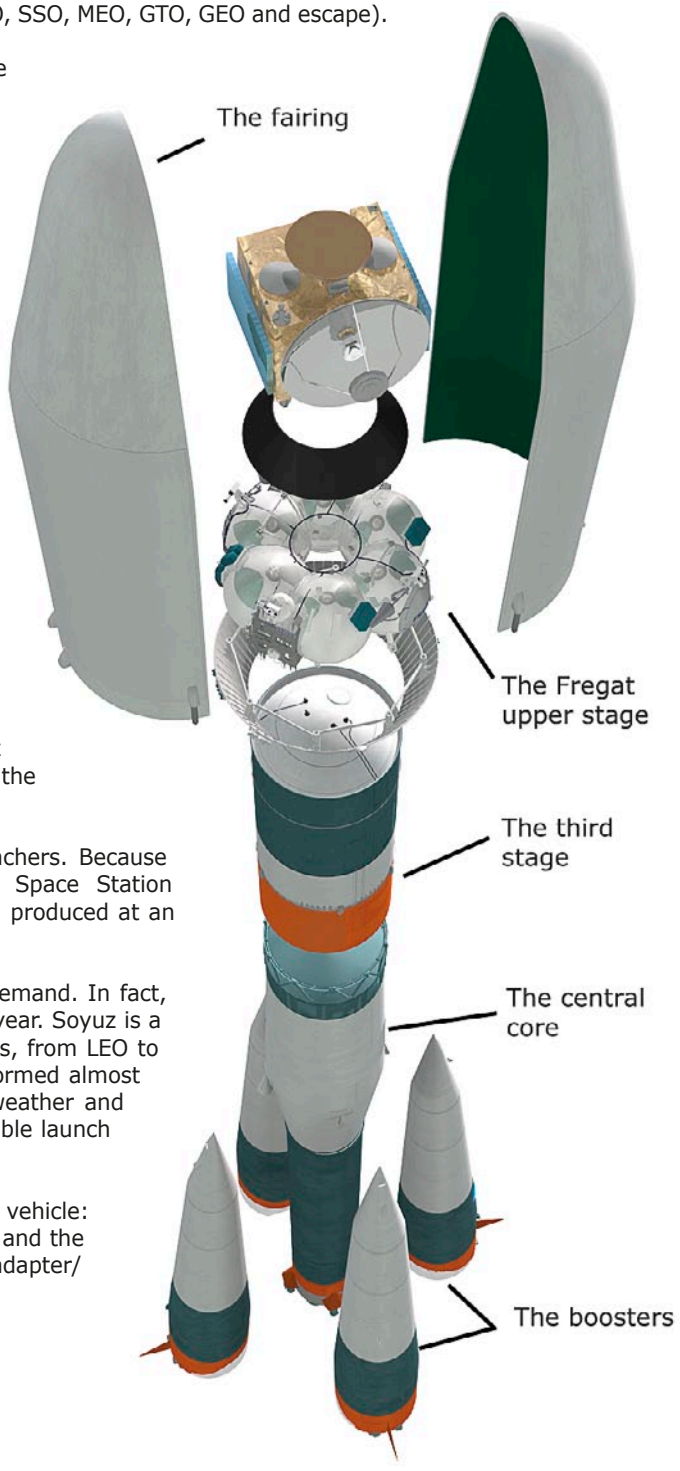
The decision of the European Space Agency to introduce Soyuz launch capability at the Guiana Space Center (CSG) marked a major step forward in expanding the range of missions. With the introduction of Soyuz at CSG, this famed Russian launch vehicle is now an integral part of the European launcher fleet, together with the heavy-lift Ariane 5 and the light Vega. Offered exclusively by Arianespace to the commercial market, for launches from CSG, Soyuz becomes Europe's standard medium launcher for both government and commercial missions.

On October 21, 2011 Arianespace successfully launched the first Soyuz rocket from the Guiana Space Center (CSG) in French Guiana, orbiting the first two satellites in the Galileo constellation.

The Samara Space Center in Russia continues to produce Soyuz launchers. Because of sustained demand from the Russian government, International Space Station requirements and Arianespace's commercial orders, the Soyuz is being produced at an average rate of 15 to 20 launchers per year.

The manufacturer can also rapidly scale up to accommodate market demand. In fact, annual Soyuz production peaked in the early 1980's at 60 vehicles per year. Soyuz is a reliable, efficient, and cost-effective solution for a full range of missions, from LEO to Mars or Venus. Offering an unrivaled heritage, Soyuz has already performed almost every type of mission, from telecommunications, Earth observation, weather and scientific satellites, to manned spacecraft. It is a very scalable and flexible launch vehicle.

The Soyuz version currently offered by Arianespace is a four-stage launch vehicle: four boosters (first stage), a central core (second stage), a third stage, and the restartable Fregat upper stage (fourth stage). It also includes a payload adapter/ dispenser and fairing.



BOOSTERS (FIRST STAGE)

The four cylindrical-conical boosters are assembled around the central core. The booster's RD-107A engines are powered by liquid oxygen and kerosene, the same propellants used on each of the lower three stages. The kerosene tanks are located in the cylindrical part and the liquid oxygen tanks in the conical section. Each engine has four combustion chambers and four nozzles. Three-axis flight control is provided by aerofins (one per booster) and steerable vernier thrusters (two per booster). Following liftoff, the boosters burn for approximately 118 seconds and are then jettisoned. Thrust is transferred to the vehicle through a ball joint located at the top of the conical structure of the booster, which is attached to the central core by two rear struts.

CENTRAL CORE (SECOND STAGE)

The central core is similar in construction to the four boosters, with a special shape to accommodate the boosters. A stiffening ring is located at the interface between the boosters and the core. This stage is fitted with an RD-108A engine, also comprising four combustion chambers and four nozzles. It also has four vernier thrusters, used for three-axis flight control once the boosters have separated. The core stage has a nominal burn time of 286 seconds. The core and boosters are ignited simultaneously on the launch pad, 20 seconds before liftoff. Thrust is first adjusted to an intermediate level to check engine readings. The engines are then gradually throttled up, until the launcher develops sufficient thrust for liftoff.

THIRD STAGE

The third stage is linked to the central core by a latticework structure. Ignition of the third stage's engine occurs approximately two seconds before shutdown of the central core engine. The third stage engine's thrust enables the stage to separate directly from the central core. Between the oxidizer and fuel tanks is a dry section where the launcher's avionics systems are located. The third stage uses the powerful RD-0110 engine with four combustion chambers and four nozzles. The RD-0110 is a staged combustion engine with a turbopump driven by gases from combustion of the main propellants in a gas generator. These combustion gases are tapped to feed the four nozzles providing stage flight control. Attitude control is provided by four steerable nozzles using gases from the gas generator. The liquid oxygen (LOX) tank is pressurized by the heating and evaporation of oxygen taken from the tank. The kerosene tank is pressurized by gases taken from the gas generator, after being cooled.

FREGAT UPPER STAGE (FOURTH STAGE)

Flight qualified in 2000, the Fregat upper stage is an autonomous and flexible stage that is designed to operate as an orbital vehicle. It extends the capability of the Soyuz launcher, now covering a full range of orbits (LEO, SSO, MEO, GTO, GEO and escape). To ensure high reliability for the Fregat stage right from the outset, various flight-proven subsystems and components from previous spacecraft and rockets are used. The upper stage consists of six spherical tanks (four for propellants, two for avionics) arranged in a circle and welded together. A set of eight struts through the tanks provide an attachment point for the payload, and also transfer thrust loads to the launcher. The upper stage is independent from the lower three stages, since Fregat has its own guidance, navigation, attitude control, tracking, and telemetry systems. The stage's engine uses storable propellants – UDMH (unsymmetrical dimethyl hydrazine) and NTO (nitrogen tetroxide) – and can be restarted up to 20 times in flight, thus enabling it to carry out complex missions. It can provide the customer with 3-axis or spin stabilization of their spacecraft.

PAYLOAD ACCOMMODATION

Soyuz launchers operated by Arianespace use the ST fairing in standard configuration, with an external diameter of 4.1 meters and a length of 11.4 meters.

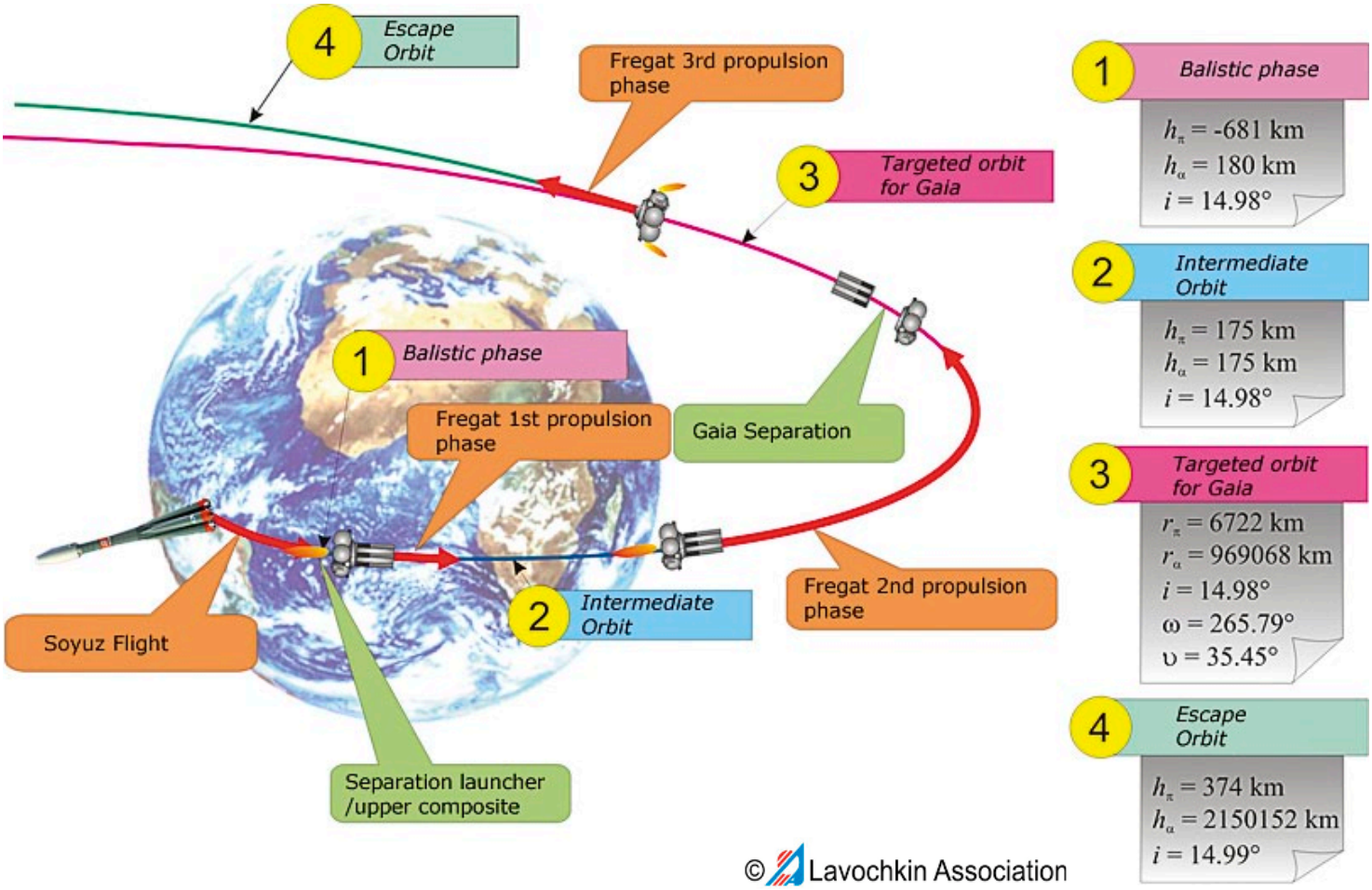
The Fregat upper stage is encapsulated in a fairing with the payload and a payload adapter/dispenser.

ETAPES DE LA CHRONOLOGIE ET DU VOL

Sont rassemblées sous le nom de chronologie, toutes les opérations de préparation finale du lanceur, des satellites et de la base de lancement dont le bon déroulement autorise l'allumage des 4 moteurs du premier étage et le moteur de l'étage central.

Event	Time (h:min:s)
Beginning of the State Commission meeting for launcher fueling authorization	-04:20:00
Beginning of launch vehicle fueling	-04:00:00
End of fueling operation	-01:45:00
Mobile gantry withdrawal	-01:00:00
Key on start (beginning of Soyuz synchronized sequence)	-00:06:10
Fregat shifts to onboard power supply	-00:05:00
Upper composite umbilical drop-off command	-00:02:25
Launcher shifts to onboard power	-00:00:40
Lower stage umbilical mast retraction	-00:00:20
Ignition	-00:00:17
Preliminary thrust level	-00:00:15
Maximum thrust level	-00:00:03
Liftoff	**00:00:00**
Jettisoning of boosters	+00:01:58
Jettisoning of fairing	+00:03:40
Separation of main stage	+00:04:48
Separation of 3rd stage	+00:04:54
Separation of boat tail	+00:09:23
Fregat 1st burn	+00:10:23
Fregat shutdown and beginning of ballistic phase	+00:12:39
Fregat 2nd burn	+00:21:25
Fregat shutdown and beginning of ballistic phase	+00:36:59
GAIA separation	+00:41:59

PROFIL DE LA MISSION GAIA



ARIANESPACE AND THE GUIANA SPACE CENTER

Arianespace was founded in 1980 as the world's first launch service & solutions company. Today, Arianespace has 21 shareholders from ten European countries (including French space agency CNES with 34%, Astrium with 30%, and all European companies participating in the construction of Ariane launchers).

Since the outset, Arianespace has signed more than 400 launch contracts and launched over 370 satellites using Ariane, Soyuz and Vega launchers from the Guiana Space Center. Nearly two-thirds of the commercial satellites now in service worldwide were launched by Arianespace.

The company posted sales of 1.329 billion euros in 2012.

Arianespace offers launch Service & Solutions to satellite operators from around the world, including private companies and government agencies. These services call on three launch vehicles:
- The Ariane 5 heavy launcher, operated from the Guiana Space Center.
- The Soyuz medium launcher, operated from the Baikonur Cosmodrome in Kazakhstan by Starsem, a Euro-Russian subsidiary of Arianespace, and from the Guiana Space Center.
- The Vega light launcher, launched from the Guiana Space Center since February 2012.

With this complete family of launchers, Arianespace has won nearly half of the commercial launch contracts open to competition worldwide in the last two years. Arianespace now has a backlog of more than 40 satellites to be launched.

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 launch facilities.

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 Ariane, Soyuz and Vega launch complexes.

French space agency CNES plays several roles at the Guiana Space Center:
- It designs all infrastructures and is responsible, on behalf of the French government, for safety and security.
- It provides the resources needed to prepare the satellites and launcher for their 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 and Soyuz 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.

Roscosmos and the Russian launcher industry

Roscosmos, the Russian space agency, is responsible for license allocations and intergovernmental relations. it is the launch authority in charge of range operations.

TsSKB-Progress (Samara Space Center) is responsible for the design, development, and manufacture of launch vehicles, including the Soyuz launch vehicle's first, second and third stages and fairing. It also integrates vehicle stages and handles flight operations.

NPO Lavochkin manufactures and integrates the Fregat upper stage, and is responsible for launch operations.

TsENKI is the launch authority in charge of launch planning and the provision of associated services, including systems engineering, and the design, and technical and operational management of the launch pad and associated facilities dedicated to the Soyuz launcher.