ARIANESPACE AND STARSEM TO ORBIT COROT

The launch of the Corot satellite is executed under the responsability of Arianespace and Starsem.

For this flight, the upgraded Soyuz 2-1b version, featuring improved navigation accuracy, control capability and more powerful third stage engine will be used. It represents the latest step in the cooperative European/Russian Soyuz evolution program. The Soyuz 2-1b configuration flight was made possible after last October's successful launch of the Soyuz 2-1a which launched MetOp-A, Europe's first polar-orbiting satellite dedicated to operational meteorology.

This flight will boost the Centre National d'Etudes Spatiales (CNES) Corot scientific spacecraft, the astrophysics pioneer mission in the discovery of telluric extrasolar planets. The purpose of this flight is to inject the 4.2 m high and 605.2 kg Corot spacecraft on a Circular Polar Orbit, at an altitude of 827 km. Corot will detect and study the stars vibrations (stellar seismology) and search for extrasolar telluric planets.

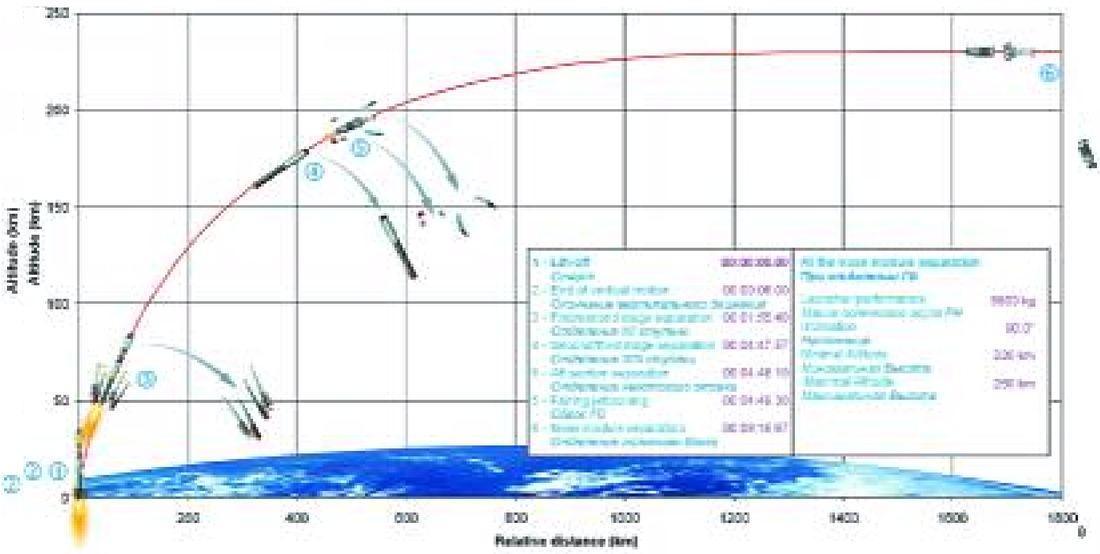
MISSION DESCRIPTION

The launch of Corot will be performed from the Baikonur Cosmodrome, Launch Pad #6.

On **Wednesday, December 27, 2006,** the launch time will be **02:23 p.m. UTC:**

08:23 p.m. Baikonur time
05:23 p.m. Moscow time
03:23 p.m. Paris time

The launch window : ±1sec



The Launch Vehicle Flight at a Glance

After lift-off from the Baikonur Cosmodrome, the flight of the three lower stages of the Soyuz launch vehicle will last for 9 min. and 16 sec. At this time, the separation between the Soyuz third stage and the nose module consisting of the Fregat upper stage and its Corot payload will occur, putting the Fregat upper stage into quasi-circular parking orbit. The three lower Soyuz stages fall back down to Earth.

The Fregat upper stage (which carries the spacecraft) will then fire its own engine, taking the nose module into a transfer orbit above the Earth. After this first burn, the Fregat upper stage will control the nose module's direction towards the Sun to maintain proper thermal conditions for the Corot spacecraft during the following coast phase, which lasts for about 35 minutes.

At the correct point on this orbit, Fregat will fire again, to reach the Circular Polar Orbit. The upper stage will then turn the nose module to stabilize it and will release the Corot spacecraft. Separation will occur 50 minutes after lift-off.

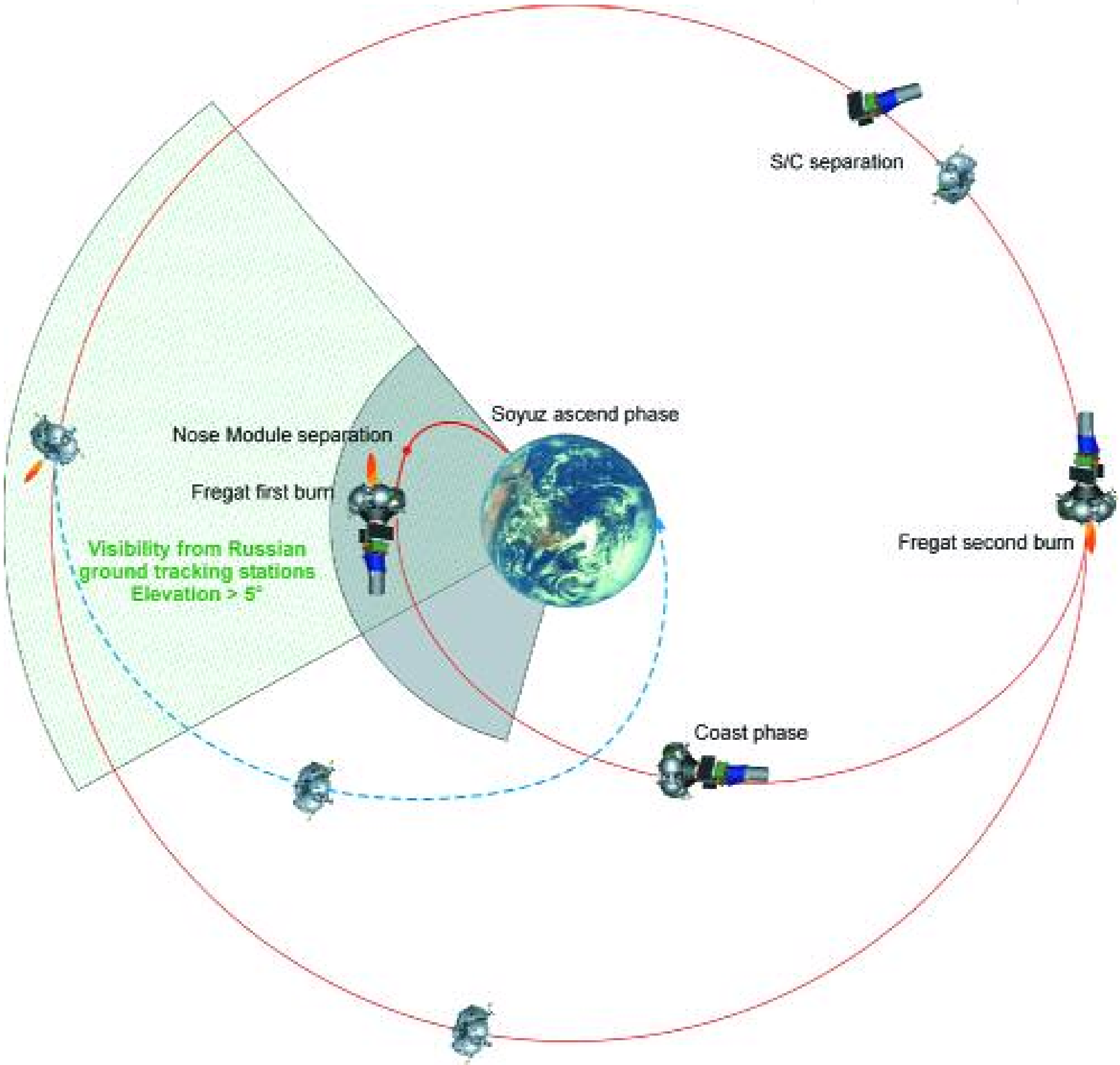
The planned orbital parameters at separation are the following:

Semi Major Axis: 7 276.3 km
Orbit inclination: 90.00 °
Eccentricity: 0.00127

Mission Duration:

The nominal mission duration (from lift-off to spacecraft separation) is 50 minutes.

PROFILE OF THE COROT INJECTION MISSION



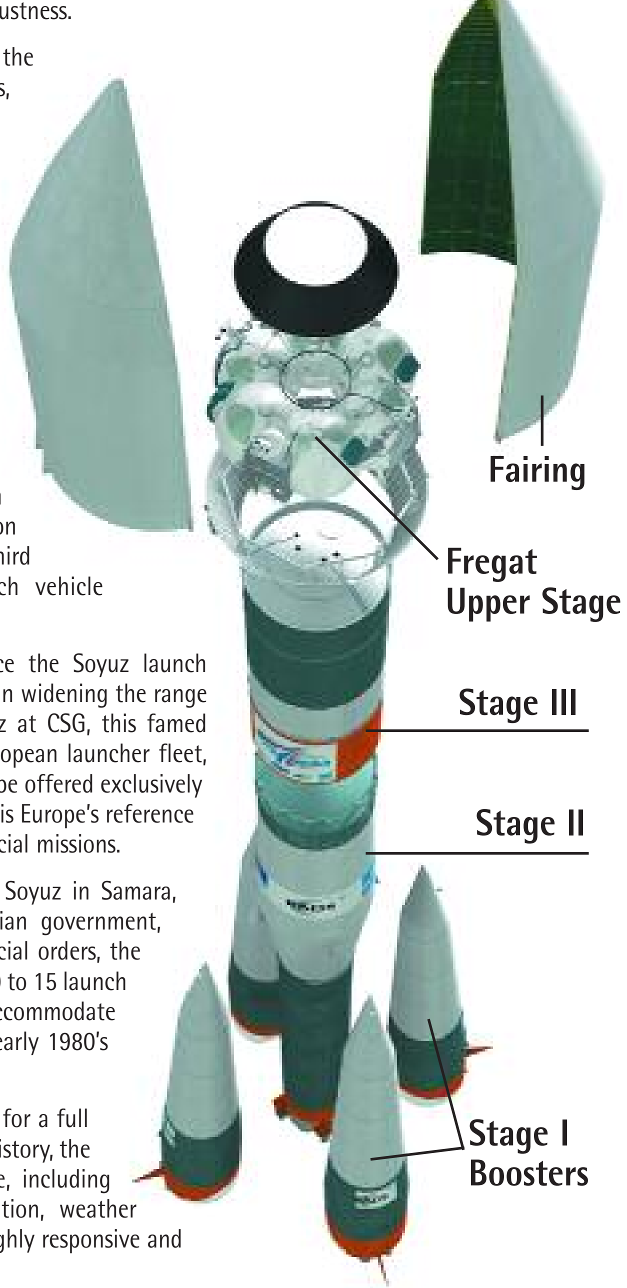
SOYUZ LAUNCH VEHICLE

The Soyuz launch vehicle family has provided reliable and efficient launch services since the birth of the space program. Vehicles in this family, which launched both the first satellite and first man into space, have been credited with more than 1715 launches to this date. Today, this vehicle is used for manned and unmanned flights to the International Space Station and commercial launches managed by Starsem.

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 in the former Soviet Union, the Soyuz benefits from very high standards in both reliability and robustness.

In 1999, Soyuz allowed Starsem to launch 24 satellites of the Globalstar constellation in 6 launches. Following this success, Starsem introduced the flexible, restartable Fregat upper stage, thus opening up a full range of missions (LEO, SSO, MEO, GTO, GEO and escape).

The inaugural flight of the Soyuz 2-1a launch vehicle performed on November 8, 2004 from the Plessetsk Cosmodrome represents a major step in the launch vehicle evolution program. This modernized version of Soyuz, which was also used to successfully launch MetOp-A on October 19, 2006, implements a digital control system providing additional mission flexibility and will enable control of the launch vehicle with the 4.1 m ST fairing. It represents a necessary milestone towards the next generation evolved Soyuz 2-1b launcher as the latest step in a cooperative European/Russian evolution program. In addition to the 2-1a version's features, it utilizes the more powerful third stage engine, significantly increasing the overall launch vehicle performance.



The decision of the European Space Agency to introduce the Soyuz launch capability at the Guiana Space Center (CSG) is a major step in widening the range of accessible missions. With the introduction of the Soyuz at CSG, this famed Russian launch vehicle becomes an integral part of the European launcher fleet, together with the heavy-lift Ariane 5 and the light Vega. To be offered exclusively by Arianespace to the commercial market, the Soyuz at CSG is Europe's reference medium-class launch vehicle for governmental and commercial missions.

The Samara Space Center continues to mass-produce the Soyuz in Samara, Russia. As a result of continued demand from the Russian government, International Space Station activity, and Starsem's commercial orders, the Soyuz is in uninterrupted production at an average rate of 10 to 15 launch vehicles per year with a capability to rapidly scale up to accommodate user's needs. In fact, peak production of the Soyuz in the early 1980's reached 60 vehicles per year.

The Soyuz is a reliable, efficient, and cost effective solution for a full range of missions from LEO to Mars. In its unequalled flight history, the Soyuz has already performed almost every mission profile, including orbiting satellites for telecommunications, Earth observation, weather monitoring, scientific missions and manned flights. It is a highly responsive and flexible launch vehicle.

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

THE BOOSTERS (FIRST STAGE)

The four boosters are assembled around the central core and are tapered cylinders with the oxidizer tank in the tapered portion and the kerosene tank in the cylindrical portion. The booster's RD-107A engines are powered by liquid oxygen and kerosene, the same propellants which are used on each of the lower three stages. Each engine has four combustion chambers and nozzles. Three-axis flight control is carried out by aerofins (one per booster) and movable vernier thrusters (two per booster). Following lift-off, the boosters burn for 118 seconds and are then discarded. The separation time is determined by comparing the velocity with a predefined value. Thrust is transferred through a ball joint located at the top of the cone-shaped 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 hammer-head shape to accommodate the boosters. A stiffening ring is located at the interface between the boosters and the core. This stage has a RD-108A engine with four combustion chambers and nozzles and four vernier thrusters. The verniers are used for three-axis flight control once the boosters have separated. The core stage nominally burns for 286 seconds. Ignition of the central core and boosters occurs at an intermediate level of thrust on the launch pad 20 seconds before lift-off in order to monitor engine health parameters before the engines are throttled up and the vehicle leaves the pad.

THIRD STAGE

The third stage is linked to the central core by a lattice-work structure. Ignition of the third stage's main engine occurs approximately 2 seconds before shutdown of the central core. The third stage engine's thrust directly separates the stage from the central core. In between the oxidizer and fuel tanks is an intermediate bay where avionics systems are located. This stage uses the new powerful RD-0124 engine with four combustion chambers and nozzles. The RD-0124 engine is a staged combustion engine powered by a multi-stage turbopump spun by gas from combustion of the main propellants in a gas generator. These oxygen-rich combustion gases are recovered to feed the four main combustion chambers where kerosene, coming from the regenerative cooling circuit, is injected. Attitude control is provided by main engine activation along one axis in two planes. LOX and kerosene tanks are pressurized by the heating and evaporation of helium coming from storage vessels located in the LOX tank. The RD-0124 engine adds an additional 34 seconds of Isp, significantly increasing the overall launch vehicle performance.

FREGAT UPPER STAGE (FOURTH STAGE)

Flight qualified in 2000, the Fregat upper stage is an autonomous and flexible upper stage that is designed to operate as an orbital vehicle. It extends the capability of the lower three stages of the Soyuz vehicle to provide access to a full range of orbits (LEO, SSO, MEO, GTO, GEO and escape). In order to provide the Fregat with high initial reliability, several flight-proven subsystems and components from previous spacecraft and rockets are incorporated into the upper stage. The upper stage consists of 6 spherical tanks (4 for propellants, 2 for avionics) arrayed in a circle, with trusses passing through the tanks to provide structural support. The stage is independent from the lower three stages, having its own guidance, navigation, control, tracking, and telemetry systems. The stage uses storable propellants (UDMH/NTO) and can be restarted up to 20 times in flight, thus enabling it to carry out complex mission profiles. It can provide the customer with 3-axis stabilization or spin-up of their spacecraft.

DIGITAL CONTROL SYSTEM

This modernized version of Soyuz includes the digital control system with a digital computer and inertial measurement unit (IMU) based on proven technology, giving the Soyuz improved navigation accuracy and control capability. The digital control system is located primarily in the equipment bay of the third stage. The introduction of the digital control system leads to the following advantages:

- A more flexible and more efficient attitude control system (ACS) capable of handling the increased aerodynamic instability generated by the larger ST fairing.
- Increased accuracy in the flight of the first three stages of the Soyuz.
- The ability to perform in-flight roll maneuvers as well as in-plane yaw steering (dog-leg) maneuvers.

PAYLOAD ACCOMMODATION

The current Soyuz flies the SL-type fairing, with external diameter of 3.7 m and a length of 8.45 m. The Fregat upper stage is encapsulated in the fairing with the payload and a payload adapter/dispenser. Starsem has already developed a series of adapters and dispensers, which may be used directly by the customer. Starsem can also carry out development of new adapter or dispenser tailored to the customer's spacecraft.

THE COROT SPACECRAFT

The Corot mission (COnvection, ROtation des étoiles et Transits des planètes extrasolaires) is a high-precision stellar photometry mission with two scientific goals: to probe the inner structure of the stars and to search for extrasolar telluric planets, both being major astronomy stakes.

With the Corot mission, due to the high-precision photometry instrument and long observation duration (up to 150 days), it is now possible to detect small and even telluric planets, like the internal Solar system's planets (Mercury, Venus, Earth and Mars). The main goal is to detect the stars vibrations and to measure their frequencies.

The Corot project, started since 1994, is carried out in cooperation with numerous European and Brazilian partners, scientifically and technically. The instrument is developed in a common team between the CNES and CNRS research laboratories.

Customer	**Centre National d'Etudes Spatiales (CNES)**
Type:	*Astronomy spacecraft*
Purpose:	*To search for extrasolar telluric planets due to the study of the stars luminous intensity.* *To detect the stars vibrations and to measure their frequencies.*
Dimensions:	*4.2 m wide by 9 m high (In-Orbit configuration)*
Mass:	*605.2 kg*
Power:	*380 W power demand*
Platform:	*Proteus*
Orbit:	*Circular Polar Orbit, at an altitude of 827 km (inclination of 90 degrees)*
Duration:	*2.5 years*
Main contractors:	*Mission, system and ground segment architect : CNES* *Satellite and platform prime contractor : Alcatel Alenia Space* *Instruments main contractors : CNES and scientific laboratories :* *Laboratoire d'Astrophysique de Marseille, Observatoire de Paris (LESIA),* *Institut d'Astrophysique Spatiale (Orsay)*
Instruments:	*The afocal telescope constituted of two parabolic mirrors allowing to decrease 3 times the equivalent entry pupil diameter;* *The camera with dioptric objective and focal bloc equipped with 4 CCD detectors (2048 x 4096);* *Equipment bay with acquisition electronics and onboard pre-treatment of photometry information.*
Ground segment:	*Network of the main broadcasting and acquisition stations (TTCET) ;* *Command and Control Center (CCC) ;* *Mission Center (CMC) ;* *Data transmission network (DCN, Data Communications Network).*

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CNES - Media Relations
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LAUNCH CAMPAIGN

Once the production and qualification activities have been completed, the spacecraft arrives at Baikonur airport and the launch campaign begins. The key events in the Corot launch campaign (L = lift-off) are:

L-6 weeks:
Launch campaign activities begin at the Cosmodrome; Corot arrives at the Cosmodrome and spacecraft preparation activities begin in Starsem's PPF

L-4 weeks:
Filling of spacecraft begins

L-4 weeks:
Preparation and assembly of the launch vehicle lower three stages begins

L-23 days:
Combined operations begin in UCIF. These activities mate the spacecraft to the adapter and Fregat upper stage, followed by encapsulation with the fairing

L-8 days:
Upper composite (spacecraft + adapter + Fregat + fairing) is transferred to assembly facility near the launch pad where it is mated to the third stage of the launch vehicle

L-4 days:
The Transfer Readiness Review ensures the Soyuz and its payload are ready for final launch pad activity and launch

L-3 days:
The fully assembled launch vehicle is transferred to the pad and erected in the vertical position. Check out and countdown rehearsal for the lower 3 stages of the vehicle takes place

L-2 days:
Countdown rehearsal for the customer's spacecraft and the Fregat upper stage

L-10 hours:
Final countdown begins. Systems checks on Soyuz begin

L-5 hours:
Systems checks begin on Fregat upper stage

L-4 h20m:
Launch vehicle filling authorization review

L-4 hours:
Launch vehicle fueling begins

L-30 minutes:
Removal of service platform

L-2m35s:
Pressurization of propellant tanks

L-45 seconds:
Transfer to on-board power supply

L-20 seconds:
Ignition of booster and core engines at intermediate thrust level

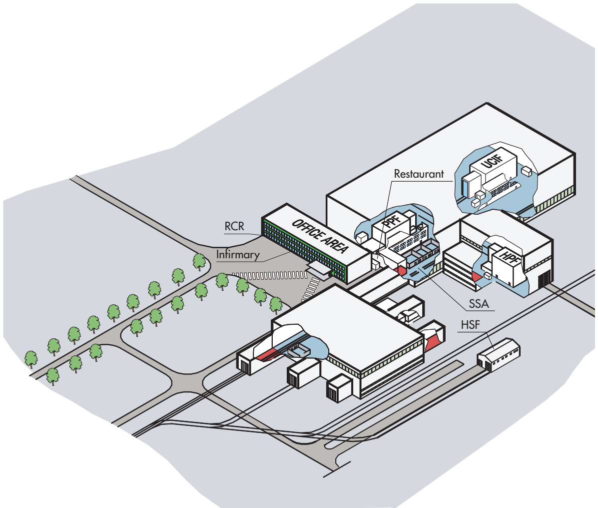
L:
Lift-off !

STARSEM BAIKONUR FACILITIES

Starsem has adapted, modified, developed, and built dedicated facilities at the Baikonur Cosmodrome which allow its customers to access to state-of-the-art facilities for their launch campaign. Central to these facilities are the three class 100,000 clean rooms used for the complete integration checkout, test, and fueling of customer's spacecraft.

SITE 112

Starsem's facilities are located primarily in two areas of the Cosmodrome: Site 112 and Site 31. Site 112 is the location of the assembly and integration facility for the former Energia launch vehicle. This facility (MIK 112) houses Starsem's dedicated clean rooms and is the location where customer's spacecraft are prepared, fueled, and eventually mated to the Fregat upper stage and encapsulated in the fairing. Customer's offices are also located in this facility. Built in 1998, Starsem's 1158-m^2 of Class 100 000 clean rooms ensure customers with international standard facilities for the preparation of their spacecraft. This allows customers to have their spacecraft in a controlled environment from spacecraft unpacking through encapsulation. Portable and fixed ventilation systems ensure the thermal conditions of the spacecraft until launch. Failsafe backup power supplies are available in all clean rooms to protect sensitive hardware during processing activities. Dedicated networks allow voice and data exchange between the clean rooms and other facilities. An independent, redundant satellite communications system provides high data rate connections between customers and their home base.



THE PAYLOAD PROCESSING FACILITY (PPF)

The PPF features a 286 m^2 high bay for the processing of customer's spacecraft. This facility has two independent 70 m^2 control rooms to permit parallel operations and personnel and equipment airlocks to ensure the integrity of conditions in the processing area.

THE HAZARDOUS PROCESSING FACILITY (HPF)

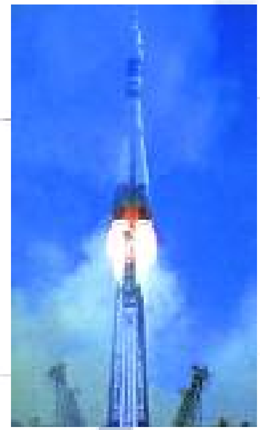
The HPF high bay covers a surface of 285 m², and is designed for spacecraft filling activities and pressurization of tanks. The HPF is designed to accommodate bipropellant spacecraft (e.g. MMH/N2O4). The facility has airlocks and an on-site control room. A remote control room in the customer office area with a dedicated data transmission system, intercoms, and video monitors ensures maximum safety for customer's launch teams. Spacecraft propellants are stored in the controlled and monitored Hazardous Storage Facility, located next to MIK 112.

THE UPPER COMPOSITE INTEGRATION FACILITY (UCIF)

Spacecraft mating with the Fregat upper stage is performed in this 587 m2 high bay, along with fairing encapsulation. The facility has equipment and personnel airlocks and a on-site control room. The remote control room in the customer office area can also be used to monitor activities in the UCIF. The data network allows the customer to carry out spacecraft testing via direct links with EGSE installed in the PPF control room.

SITE 31

Site 31 includes the launch pad, assembly and integration facility for the launch vehicle (MIK 40), and administrative buildings. After encapsulation, customer's spacecraft is transported to MIK 40 under a controlled environment to be mated to the rest of the launch vehicle in MIK 40. Following integration, the vehicle is rolled out to the launch pad.



STARSEM'S FOUNDING COMPANIES

As the Soyuz Company, Starsem brings together four of the world's leading space organizations

ASTRIUM

ASTRIUM, a wholly owned subsidiary of EADS is dedicated to providing civil and defense space systems. In 2005, ASTRIUM had a turnover of € 2.7 billion and 11,000 employees in France, Germany, the United Kingdom and Spain. Its activities are based on three main subsidiaries: ASTRIUM SAS - Space Transportation, for launchers and orbital infrastructure, ASTRIUM SAS for satellites and ground segment and ASTRIUM SAS - Services to develop and deliver satellite services. EADS is a global leader in aerospace, defense and related services. In 2005, EADS generated revenues of € 34.2 billion and employed a workforce of more than 113,000.

ARIANESPACE

Arianespace is the international leader in commercial launch services, and today holds 50 percent of the world market. From its creation in 1980 as the first commercial space transportation company, Arianespace has successfully performed over 173 launches and signed contracts for more than 279 payloads with some 64 customers. Arianespace is in charge of the marketing and sales, production and operation of Ariane launch vehicles. Arianespace has placed the Ariane 5 launcher into commercial service to meet the market requirements of today and tomorrow. This offer is strengthened by the flexibility provided by the Soyuz and Vega launchers. Based in Evry, France, Arianespace has 23 European corporate shareholders.

RUSSIAN FEDERAL SPACE AGENCY – ROSCOSMOS

The Russian Federal Space Agency - Roscosmos is the central body of the federal executive authority defining the Russian Federation's national policy in the field of space research and exploration. The agency also performs interdisciplinary coordination of national scientific and application space programs. It was created in February 1992 by a decree issued by the President of the Russian Federation. Agency's responsibilities include: development and implementation of Russian national space policy; acting in the capacity of government customer in the development of scientific and application space systems, facilities and equipment; establishing international cooperation and collaboration in space research, and organization/coordination of commercial space programs. Operations under Agency responsibility include several hundred space companies and organizations.

SAMARA SPACE CENTER

The Samara Space Center "TsSKB-Progress" was created by a Russian Presidential decree in 1996 by combining the TsSKB Central Samara Design Bureau and the Progress production plant. The Samara Space Center is one of the world leaders in the design of launchers, spacecraft and related systems. Its history goes back to the start of the space program in 1959 when a branch of the Moscow OKB-1 design bureau was established in the city of Kuibyshev (now known as Samara).