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TECHNICAL **INFORMATION**

ariane 5

The reference **for new generation heavy-lift launchers**

Arianespace is the world's commercial space transportation leader, earning this position through the management, marketing and operation of Europe's reliable Ariane 1-4 launcher series.

To meet tomorrow's market requirements, Arianespace is introducing the Ariane 5 heavy-lift launcher. This capable new vehicle is perfectly tailored to the increasingly diversified demand for service - including heavier and larger satellites, a wider range of orbits and combined missions. Ariane 5 is based on a modern design offering excellent performance and reliability, which ensures Arianespace will continue the high quality of service that has been its key to success. In keeping with the proven Ariane philosophy, Ariane 5 will evolve into a family of launchers that responds to the space transportation challenges of the 21st century.

The development **program**

Twelve European countries supported the Ariane 5's go-ahead and development in 1985 and 1987.

> A European will

The first studies for a follow-on launcher to the workhorse Ariane 4 were initiated in 1977. It was during the European Space Agency's council meetings in January 1985 and November 1987 that firm decisions on the development of Ariane 5 were taken. The prime contractor responsibility for this effort was delegated to the French space agency, CNES (Centre National d'Etudes Spatiales).

This new launch vehicle was designed to increase the Ariane family's payload lift capability, while providing even better operational reliability and increasing the competitive edge for Arianespace.

The resulting design was a departure from the concept used since the beginning of the Ariane program. The number of stages and engines on Ariane 5 was reduced to a minimum, and the major propulsion role was given to high-energy cryogenic propellants and to solid rocket motors. Redundant electrical systems also were incorporated as part of the steps to further improve reliability.

From the start, Ariane 5 was designed with future performance upgrades in mind - primarily through the improvement of propulsion systems and the introduction of new upper stages.

To develop the new heavy-lift launcher, Europe's space industry had to achieve several technological breakthroughs. In the field of cryogenic propulsion, a large main engine was developed to deliver a thrust equivalent to 18 times that of its predecessor. The solid rocket motors are ten times larger than the most powerful ones previously built in Europe.

New infrastructure was developed in Europe and at the Spaceport in French Guiana to allow development, test and production of the new launcher in parallel with Ariane 4's ongoing production and commercial operations.

Seven full-size solid rocket boosters were test-fired in Kourou.

> Milestones

Ariane 5's development began in earnest during 1985 with preliminary studies of the Vulcain cryogenic engine - which was conceived to power the launcher's core stage. The first Vulcain engine was test fired in July 1990, and a nominal flight-time firing test was conducted in June 1991 at Vernon, France. In eight years of testing, Vulcain engines have logged a cumulated burn time of 125,000 seconds.

The upper stage Aestus engine for Ariane 5, which operates on storable propellant, performed its first firing test in vacuum at Lampoldshausen, Germany, in late 1992. In October 1994, a static firing test saw the engine operate for more than 1,000 seconds.

For the Ariane 5 solid rocket boosters, a series of subscale tests cleared the way for a first full-scale static test firing in February 1993 at the French Guiana Spaceport, using a "battleship" (reinforced, non-flight) casing. Six subsequent static firing tests, which ran through July 1995, were conducted with flight-type casings.

Ariane 5's ground testing was completed after a series of six hot firing tests of the launcher's core cryogenic stage, which ran from June 1995 to January 1996 in French Guiana.

Arianespace kicked off the production of operational Ariane 5s in June 1995, placing an order with European industry for its first 14 heavy-lift launchers.

More than 200 test runs were performed with the Vulcain main engine starting in June 1991.

Ariane 5 qualified for commercial service

Three qualification missions were performed with Ariane 5 prior to its entry into commercial service. These flights validated the launcher's ability to provide reliable, high-quality service for Arianespace customers. The missions enabled final development challenges to be resolved with the launcher's new design architecture, and also allowed Arianespace's teams to familiarize themselves with Ariane 5 launch procedures. This was accomplished in parallel to the ongoing Ariane 4 launch operations, ensuring the continuation of commercial service without interruption.

> The three qualification flights

L501 / V88

The Ariane 5's maiden flight on June 4, 1996, was interrupted after 37 seconds due to a software failure in the inertial reference system. The loss of guidance and attitude led to the launcher's breakup under aerodynamic loads. In spite of this failure, numerous critical phases of the mission were demonstrated.

The software mishap was identified and corrected. A complete review of the launcher at hardware and software levels confirmed the concept's basic robustness and reliability. The decision was taken to add a third flight to the Ariane 5 qualification program.

L502 / V101

This second flight, conducted on October 30, 1997, provided a full evaluation of the launcher through the operation of all stages. A spin in the boundary layer of the Vulcain engine exhaust induced a strong roll motion on the core stage after release of the solid boosters. This torque could not be counterbalanced by the launcher's attitude control system, and caused premature shutdown of the core stage's propulsion system. The upper stage burned its propellant to depletion of its reserves but couldn't compensate the performance loss and the payload was released on a degraded transfer orbit.

The phenomenon that caused the roll torque was identified, modeled and corrected after a series of ground tests.

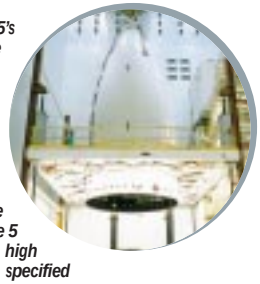
L503 / V112

For this mission, the Vulcain engine was modified to cancel the roll torque that occurred on the previous flight. Ariane 5 performed a completely successful flight on October 28, 1998, demonstrating its capability to conduct complex deployment missions to low-Earth orbits as well as high-altitude orbits. The launcher released the European Space Agency's Atmospheric Reentry Demonstrator capsule on a suborbital trajectory, and then boosted a satellite mockup to geostationary transfer orbit.

Launch capability demonstrated

The qualification flights demonstrated Ariane 5's capability to launch dual payloads to geostationary transfer orbit (GTO). After this qualification, Ariane 5's launch performance to GTO with a single payload was increased to 6,200 kg. The injection accuracy is excellent, as demonstrated by the launcher on its third flight: less than 19 km from the targeted mean altitude, and within 0.001° of the nominal inclination. This level of precision is achieved regularly by Ariane 4, which has become the world's market reference for launch vehicle performance.

Payload fairing environment



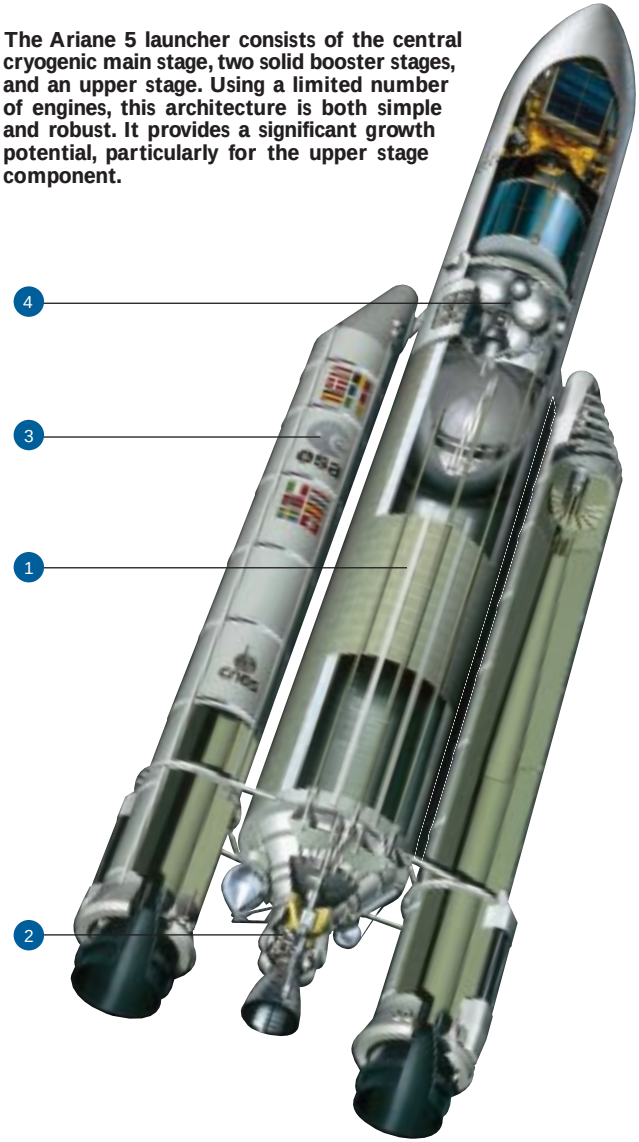
Dynamic and acoustic levels recorded under Ariane 5's payload fairing during the qualification flights meet the predictions, and are totally compatible with the launch of commercial payloads. The dual compatibility between Ariane 4 and Ariane 5 was confirmed.

Quasi-static loads on Ariane 5 are similar to those on Ariane 4, and a modification of the flame ducts on the launch pad assures an optimal compatibility.

Acoustic levels for the payload do not exceed the specifications at ignition of the Vulcain engine, and Ariane 5 proved to be a relatively low noise launcher at high frequencies. Shock levels recorded in flight were at the specified values.

Lifting power

The Ariane 5 launcher consists of the central cryogenic main stage, two solid booster stages, and an upper stage. Using a limited number of engines, this architecture is both simple and robust. It provides a significant growth potential, particularly for the upper stage component.



1 The main cryogenic stage

This 30-meter-tall stage is the core of the Ariane 5 launcher. It operates for a total of 589 sec., and includes the attach points for Ariane 5's two solid boosters. The main cryogenic stage is ignited on the pad, and once the two solid boosters are jettisoned in flight, it continues as the sole source of propulsion for an additional 459 sec. of powered flight. The cryogenic propellant used in the stage is non-toxic. At the end of its flight, the main cryogenic stage reenters the atmosphere and disintegrated over the Ocean.

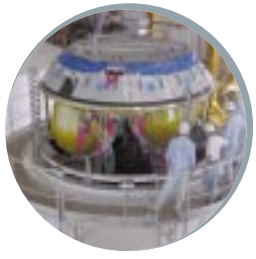
2 The Vulcain engine

The Vulcain engine powers Ariane 5's main cryogenic stage. It provides up to 116 metric tons of thrust in vacuum. The Vulcain is ignited on the launch pad seven seconds before liftoff, allowing full monitoring of the engine during its startup and the stabilization of thrust.

3 The solid booster stages (EAP)

The mission of the two solid boosters is to propel the 725-metric ton Ariane 5 from launch table with an acceleration of 0.5 G at liftoff. Standing more than 30 meters tall, the boosters are loaded with 237.8 metric tons of solid propellant each. They deliver a combined thrust of 1,370 metric tons at liftoff - which is more than 90 percent of the total launcher's thrust at the start of flight. The boosters burn for 130 sec. with an average thrust of 1,000 metric tons before they are separated over a designated zone of the Atlantic. They can be recovered for post-flight analyses.

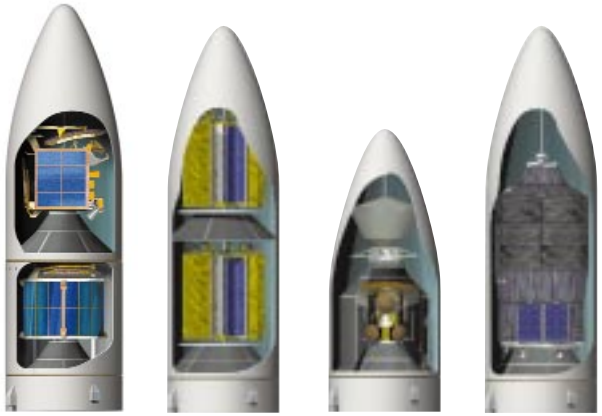
4 The storable propellant stage (EPS)



The EPS is the first upper stage developed for Ariane 5. It propels the launcher's payload to its final orbit and provides an accurate orbital injection. The stage carries 9.7 metric tons of propellant (nitrogen tetroxide and monomethyl hydrazine) for its 3 metric ton-thrust, pressure-fed Aestus engine.

Payload fairings for all missions

To fulfill a full range of missions, Ariane 5 can be fitted with a variety of payload fairings, adapters and structures for single-, dual- or multiple-payload launches.



Dual GTO | *Multiple LEO* | *Scientific* | *ATV*

> The payload fairings

Two payload fairing versions are available on Ariane 5, both with the useful inner diameter of 4.57 m. The short fairing version, which is 12.7 meters long, can accommodate payloads more than 11.5 meters high. The long fairing, which is 17 meters long, can house payloads more than 15.5 meters high. These dimensions are exceptionally large for the commercial launch market, and they enable Ariane 5 to launch all types of satellites currently in service, as well as those in development.

These fairings incorporate acoustic protection to provide an excellent environment for payloads during all phases of launch. The combination of a long or short fairing with the Sylda or Speltra satellite deployment systems allows two or more satellites to be launched by an Ariane 5. The Sylda and Speltra adapt Ariane 5 to the size and mass of the spacecraft to be orbited.

> The vehicle equipment bay

Acting as the Ariane 5's "brain", the Vehicle Equipment Bay incorporates most of its avionics – including the two onboard computers for flight guidance (one prime and one backup), and the primary and backup inertial measurement units that provide guidance and attitude data to the computers. The Vehicle Equipment Bay also houses the attitude control system, which supplies launcher roll control after the booster separation, and 3-axis control during the upper stage's burn and payload deployment maneuvers.

> The dispensers

Ariane 5 can be fitted with two dispenser types for missions with clusters of spacecraft, in particular for the deployment or replenishment of satellite constellations. The "platform" type is used to carry spacecraft that are designed with mounting interfaces at their base. The "boom" type accommodates satellites with attach points on their interior face. The dispensers are conceived for use on both dedicated missions and flights in which the satellite cluster is launched with another satellite payload.

Adapters for all payloads

To accommodate all payloads in the marketplace, Arianespace has developed a full range of payload adapters for all satellite/launcher combinations: single-payload launch, double launch, and auxiliary payloads.

> The payload adapters

To accommodate payloads weighing from 1,000 kg to 18,000 kg, Ariane 5 can be fitted with 9 different adapter models. These adapters are either conical or cylindrical, and have separation interface diameters of 937 mm, 1,194 mm, 1,663 mm, 1,666 mm, 2,624 mm or 3,936 mm. The adapters, most of which have a clamp band payload separation system, are compatible with all existing satellite platforms.

> The Ariane structure for auxiliary payloads (ASAP)

The ASAP platform, which can be mounted on top of the upper stage as well as on the Speltra or Sylda structures, carries mini- or microsatellites as secondary payloads. When located under a primary payload, the ASAP platform accommodates up to eight microsatellites, each weighing under than 120 kg. When mounted inside a dedicated Sylda structure, it can carry up to four minisatellites weighing up to 300 kg each, or two 300 kg minisatellites and six 120 kg microsatellites.

> The external structure for dual launches (Speltra)

The Speltra structure, which is positioned between the upper stage and the payload fairing, allows Ariane 5 to carry two primary payloads on a single flight. One satellite is accommodated inside the Speltra, while the other is mounted atop the Speltra and is enclosed in the payload fairing. The Speltra can house payloads with external diameter of 4.57 m. The standard Speltra version, which is 7 m high, is sized for satellites of more than 6 m high in launch configuration. A short version and a stretched version of Speltra are also offered.

> The internal structure for dual launches (Sylda 5)

The Sylda 5 structure is housed inside the fairing, and allows Ariane 5 to launch two primary payloads on a single flight. It has a useful inner diameter of 4 meters, and exists in 6 versions to accommodate satellites with a maximum height of 2.9 to 4.4 meters.

Ariane 5 Plus

Ariane 5 was designed as the first member of a family of launch vehicles. Its future evolution will enable the launcher to meet the demands of a changing market, including the dramatic growth in satellite mass and an increasing number of orbits to be served (for satellite constellations, in particular). The Ariane 5 Plus program, initiated by the European Space Agency in June 1998 and given the full-scale go-ahead in May 1999, will drive the evolution of Ariane 5 with the development of new upper stages. The management of this program is handled by the Ariane Development Department, jointly operated by the French CNES space agency and Arianespace.

> Performance

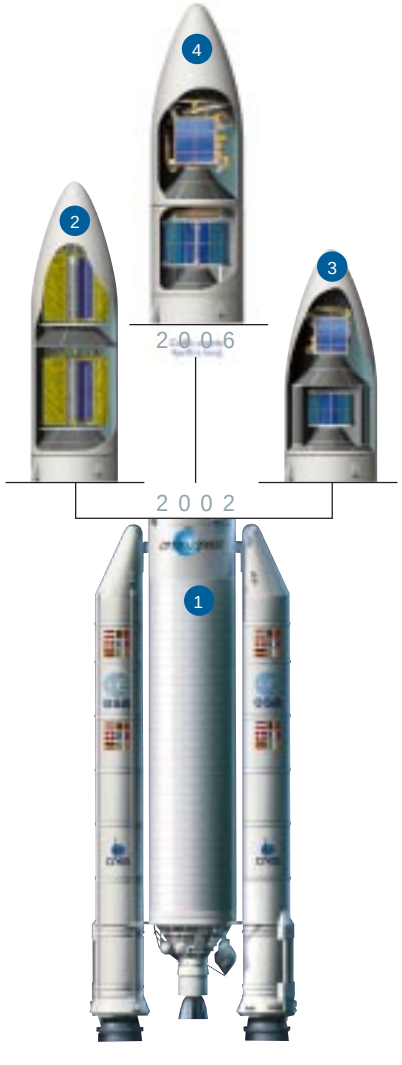
The Ariane 5 Plus program is the follow-on to the Ariane 5 Evolution effort, and involves improvements to the launcher's lower composite (which is composed of the main cryogenic stage and the solid booster stages). The improvements are focused on structural weight reduction, major modifications to the solid boosters and the main cryogenic stage, as well as a thrust increase to 138 metric tons for the cryogenic stage's Vulcain main engine. Introduced in parallel with the development of new Ariane 5 upper stages, these improvements will lead to progressive gains in performance through 2001.

An improved version of the current EPS upper stage will enter service in late 2001. This "Versatile" EPS, combined with the improvements to Ariane 5's lower composite, will increase the launcher's payload lift capability to 7,300 kg with a double payload to geostationary transfer orbit. With its in-flight restart capability and an operational time of several hours, the improved upper stage will allow for more complex missions, including the deployment of constellations and scientific satellites.

One of the most important elements of the Ariane 5 Plus program is the development of two new cryogenic upper stages – the ESC-A and ESC-B – which will further increase the launcher's payload lift capacity. With these new stages, Ariane 5 will be able to carry a 10,000 kg dual-satellite payload to geostationary transfer orbit beginning in late 2001, increasing to more than 11,000 kg from late 2005.

> Fit for any mission

With its new upper stages, Ariane 5 will be able to perform all types of missions in the coming decade. These include the traditional Ariane dual satellite launches to GTO, missions to high-perigee GTO or direct geostationary insertion, interplanetary launches, the deployment of satellite constellations in medium-Earth orbit (MEO) or low-Earth orbit (LEO), as well as launches of Earth observation satellites in low-Earth and Sun-synchronous orbit. The high maneuverability of these stages will also enable the launch of combined missions with payloads deployed at different orbits.



Ariane 5 ESC-B (4)

The ESC-B will be loaded with 25 metric tons of liquid oxygen and liquid hydrogen to feed the new 15.5 metric ton-thrust Vinci engine. Vinci uses the expander cycle. With the capability to perform multiple restarts in ballistic flight, it will improve Ariane 5's payload capability in dual GTO launch to 11,000 kg (with Speltra) and 12,000 kg in a single-payload mission to GTO.

Ariane 5 ESC-A (3)

Powered by the same 6.5 metric ton-thrust HM-7B engine as used in Ariane 4's third stage (which is designed for ignition once during flight), the ESC-A is to carry 14 metric tons of liquid oxygen and liquid hydrogen propellant. The ESC-A will allow Ariane 5 to place 10,000 kg into geostationary transfer orbit on a dual-payload mission (using the Sylda system), and 10,500 kg into GTO while carrying a single, large payload.

Ariane 5 Versatile (2)

With the application of the improved version of Ariane 5's current EPS upper stage, the launcher will have a payload capability of 7,300 kg in a dual-payload mission to GTO (with Speltra) and 8,000 kg in a single-satellite launch to GTO. This "Versatile" EPS will be able to fly ballistic coast phases and make multiple restarts. It will be used primarily for missions to low-Earth and medium-Earth orbits, but also will be able to deliver payloads to GTO and high perigee GTO (GTO+), as well as directly to geostationary orbit. In addition, it will enable the launch of scientific satellites to dedicated high perigee orbits.

Lower Composite (1)

Ariane 5's lower composite (cryogenic main stage and solid booster stages) will undergo change as part of the Ariane 5 Evolution program. Changes include the core stage's modification by shifting the location of the common bulkhead between propellant tanks – thereby increasing the quantity of liquid oxygen that can be loaded. In parallel, the liquid oxygen/hydrogen mixture ratio will be increased for the new Vulcain 2 engine – an upgraded version of the Vulcain currently used on Ariane 5. The Vulcain 2 will produce 138 metric tons of thrust. Another change is the replacement of the solid rocket booster casings' bolted joints by welded casing joints – resulting in a reduction of weight. The loading of an additional 2.4 metric tons of solid propellant in the boosters' upper cast segment will increase their maximum thrust from 685 metric tons to 714 metric tons each.

The Ariane 5 **launch campaign**

A new infrastructure has been built at the Kourou launch facility for Ariane 5's commercial operations. The launcher components arrive in French Guiana by sea, while the payloads are brought by air. The dedicated, integrated facilities of Ariane Launch Complex #3 (ELA-3) include the Ariane 5's launcher integration and processing buildings, as well as the launch zone. With its streamlined launch campaign of only 20 days and the use of two mobile launch tables, Arianespace guarantees an easy access to space with 8-10 Ariane 5 launches per year.

The new S5 processing facility for geostationary orbit payloads and constellation satellites.

> The S5 building

The new S5 Payload Processing Facility is scheduled for operation in December 2000, and will double the existing payload processing capacity. With a surface of 1,400 sq. meters, the S5 meets processing requirements of the new generations of satellites, and will provide increased flexibility in the preparation of spacecraft to be orbited by Ariane 5. The S5 will incorporate two facilities for hazardous activity (such as propellant loading and installation of pyrotechnics), allowing several launch campaigns to be conducted at the same time. The S5 is therefore particularly well suited to handle satellite clusters for constellation launches, enabling parallel processing of each satellite, its fuelling and its integration on the dispenser. The payloads will then be transferred in a special container to the Final Assembly Building.

The Ariane 5's main stage elements come together for the first time in the Launcher Integration Building.

> Launcher integration building (BIL)

The 58-meter-tall Launcher Integration Building (BIL) is used for the mating of the launcher's stages. The launch campaign begins in this facility with the positioning of Ariane 5's core cryogenic stage over one of the two mobile launch tables. The two solid booster stages are mated on the sides of the cryogenic core stage. The core stage is topped off with one of the upper stages (EPS, ESC-A or ESC-B, depending upon the mission) as well as the Vehicle Equipment Bay. The Ariane 5 vehicle is linked to the launch table via an umbilical mast, which has an assembled height of 30 meters. After operations are completed in the Launcher Integration Building, the launch table with its assembled launcher is transferred to the Final Assembly Building via a dual track rail line.

> Final assembly building

Once inside the 90-meter-tall Final Assembly Building (BAF), the launcher receives its payload, along with the Sylda or Speltra structures (if any), and the payload fairing. These payload elements are processed within an encapsulation hall inside the Final Assembly Building. The payload is then hoisted by a traveling crane and transferred for installation atop the launcher. The launch table's umbilical mast is fitted with a 20-meter extension, which includes connections for the payload fairing's air-conditioning system. The EPS upper stage and the launcher's integrated attitude control system are fuelled in the final assembly building. When integration activity in the Final Assembly Building is finished, the mobile launch table with its completed launcher is rolled out to the Launch Zone (ZL). This step occurs about 12 hours before launch.

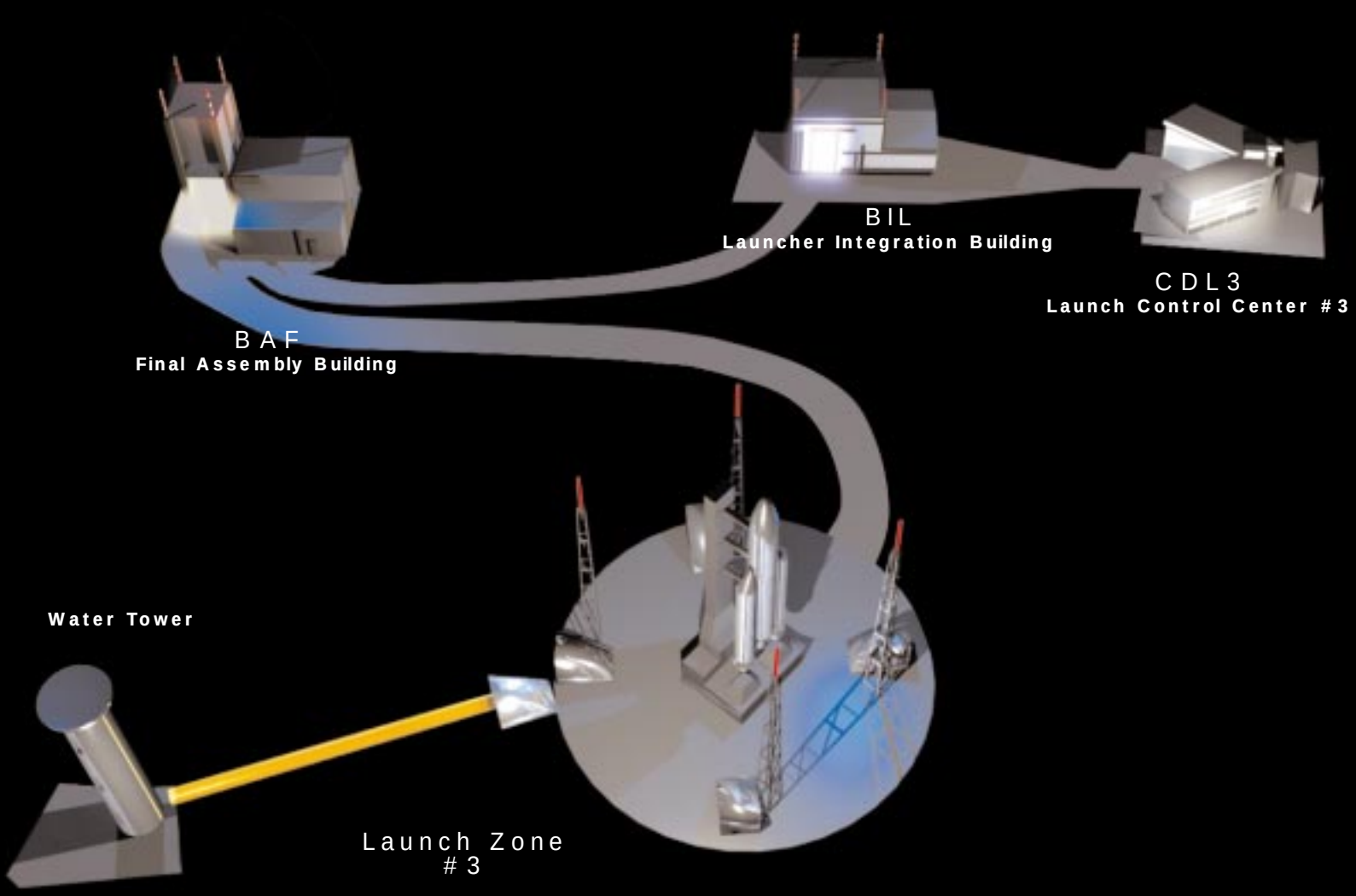
The payload is mounted on Ariane 5 in the Final Assembly Building.

> Launch zone

Separated from the other facilities by a distance of 2.8 km for safety reasons, the Launch Zone has a simple and clean design. This is where the most dangerous operations are conducted, including the propellant loading of the cryogenic central stage – followed by ignition of the Vulcain main engine and solid booster stages, and the launcher's liftoff. The Launch Zone is composed of a concrete foundation with three flame trenches, and a water tower with a capacity of 1,500 cu. meters to provide a water deluge into the flame trenches and around the launch table to dampen acoustic and thermal effects. Two cryogenic propellant storage areas are located in the vicinity of the pad, and the locally produced propellant is brought to this location a few days before launch. Four pylons positioned around the Launch Zone provide lightning protection, and a tower on the pad shields the launcher against wind turbulence at liftoff.

Ariane 5 spends only a few hours in the Launch Zone before liftoff.

The Ariane 5 **Launch Complex**



A world-renowned **industry team**

Ariane 5 is the work of a European industrial team with 20 years' experience in building and operating Ariane. The team has all of the design, development and production tools at its disposition to respond to the market's needs for commercial launches – ensuring that Arianespace remains the # 1 in this sector.

The Ariane 5 team builds on more than 20 years of space transportation expertise.

> Quality & reliability

The Ariane program is based on the capabilities of companies in 12 European countries, using the resources of 12,000 people in Europe and French Guiana. Launcher production is directed by Arianespace through eight first-level contractors. A test program managed with the European Space Agency ensures the continuous quality control during all phases of production. Moreover, a systematic analysis of flight data following each mission provides valuable operational know-how, allows for continuous improvements and creates the basis for trend monitoring.

The figures speak for themselves: the Ariane 4 had a mission success rate of 97.4 % as of november 1999, with 49 successes in a row – a world record for commercial launch vehicles.

For Ariane 5, a design mission reliability of 98.5% is targeted, with the new vehicle's design incorporating even more robust system elements and redundant electrical systems. The Ariane 5 also will benefit from even better quality control – the result of extensive experience with the predecessor Ariane versions.

Full-scale production of Ariane 5 was initiated by Arianespace in June 1995.

> Production capacity

In order to address market needs, the Ariane 5 industrial infrastructure in Europe and French Guiana was designed on a production basis of eight launchers per year. This rate should be reached in 2002. Today, Arianespace and its industrial partners are investing to boost the production output, enabling the rate to reach 10 launches per year after 2002. This effort will require a 50% reduction in production time as early as 2003.

As a result of the increase in production rate, Arianespace will be able to provide high-quality - and extremely competitive - launch services to satellite operators and space agencies.

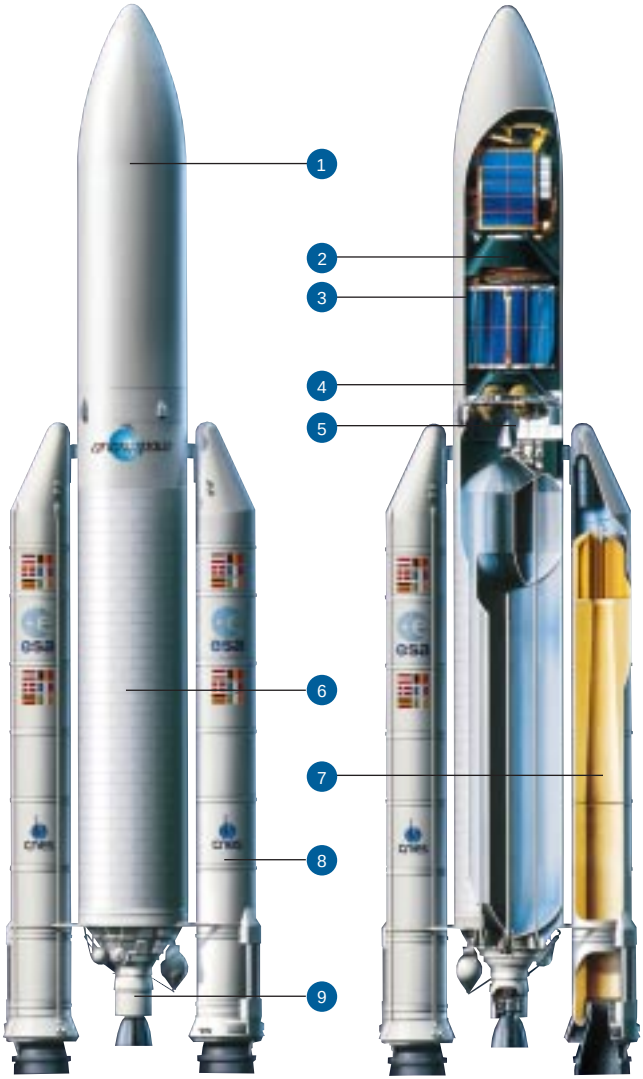
> Who does what ?

Industrial architect: Aerospatiale Matra Lanceurs

1. **Payload fairing**
   Prime: Contraves Space
   Subcontractors: Aerospatiale Matra Lanceurs, DaimlerChrysler Aerospace, Dassault, SF Emmen, Framatome, Raufoss
2. **Payload adapters**
   Prime: CASA, Matra Marconi Space, Saab Ericsson Space
   Subcontractors: Aerospatiale Matra Lanceurs, Dornier Satellitensisteme, Matra Marconi Space UK, Saab Ericsson Space
3. **Speltra and Sylda 5**
   Prime: DaimlerChrysler Aerospace Dornier
   Subcontractors: Aerospatiale Matra Lanceurs, Dassault, Framatome, HRE, Raufoss
4. **Vehicle equipment bay**
   Prime: Matra Marconi Space
   Subcontractors: Alcatel Denmark Space, Alcatel ETCA, CASA, Crisa, DaimlerChrysler Aerospace, Dassault, Framatome, In-Snec, Raufoss, Saab Ericsson Space, Sextant, Thomson Hybrides
5. **Storable propellant upper stage**
   Prime: DaimlerChrysler Aerospace
   Subcontractors: Aerospatiale Matra Lanceurs, Alcatel Denmark Space, Aljo, CASA, Dassault, Franke, Industria, Moog, Rellumix, Raufoss, Walther, Witzemann
6. **Main cryogenic stage**
   Prime: Aerospatiale Matra Lanceurs
   Subcontractors: Alcatel ETCA, Alcatel Denmark Space, Cryospace, DaimlerChrysler Aerospace, Elecma, Fokker Space, In-Snec, MAN Technologie, Sabca, Saft, SAT
7. **Solid rocket motor**
   Prime: Europropulsion
   Subcontractors: Andritz, FiatAvio, MAN Technologie, Regulus, Snecma
8. **Solid rocket boosters**
   Prime: Aerospatiale Matra Lanceurs
   Subcontractors: Fokker Space, Kongsberg, Raufoss, Sabca
9. **Vulcain propulsion system**
   Prime: Snecma
   Subcontractors: Auxitrol, Avica, CASA, DaimlerChrysler Aerospace, Devtec, Fagor, FiatAvio, MAN Technologie, MCG, Microtecnica, SNR, Stork, Techspace Aero, Vibrometer, Volvo Aero

Glossary

> Who does what ?



ACU	**Payload Adapter**
Aestus	**EPS engine**
ASAP	**Ariane Structure for Auxiliary Payloads**
BAF	**Final Assembly Building**
BIL	**Launcher Integration Building**
CNES	**Centre National d'Etudes Spatiales**
CSG	**Guiana Space Center**
CU	**Payload**
EAP	**Solid Booster Stage**
ELA-3	**Ariane Launch Complex #3**
EPC	**Core Cryogenic Stage**
EPCU	**Payload Processing Facility**
EPS	**Storable Propellant Stage**
ESA	**European Space Agency**
ESC-A	**Cryogenic Upper Stage, model A, with HM-7 engine**
ESC-B	**Cryogenic Upper Stage, model B, with Vinci engine**
GEO	**Geostationary Earth Orbit**
GTO	**Geostationary Transfer Orbit**
MEO	**Medium Earth Orbit**
LEO	**Low Earth Orbit**
SCA	**Attitude Control System**
Speltra	**External Structure for Ariane Multiple Launch**
Sylda	**Ariane Dual Launch System**
UPG	**Guiana Propellant Plant**
VEB	**Vehicle Equipment Bay**
Vinci	**The ESC-B upper stage 's cryogenic engine**
Vulcain	**The core cryogenic stage's main engine**
ZL-3	**Ariane Launch Zone #3**