## Air and Space this Week

#### Item of the Week

# THE EUROPEAN SPACE AGENCY TURNS 50

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NASA, Russia, and China aren't the only big players in Space exploration. The launch of Sputnik 1 on October 3, 1957 catalyzed the interest in missiles and satellites in the U.S., but it also caught the attention of a number of leaders in Europe. The end result was the creation of a multi-national European Space Agency. European countries formed the European Space Agency on **May 30, 1975, fifty years ago this week.** 

### **ORIGIN OF ESA**

Sputnik created a Space-oriented environment in Europe, which enabled two prominent scientists to drum up enough attention to inspire eight countries to collaborate in two organizations, the European Launcher Development Organisation and the European Space Research Organisation. The rocketry group was unsuccessful, but the ESRO was able to get a handful of satellites to LEO during the Apollo days.

An ESA Convention was held in 1975, where the ELDO and ESRO were merged into a single organization, the **European Space Agency**. Ten nations were involved: Belgium, Denmark, France, Italy, the Netherlands, Spain, Sweden, Switzerland, the United Kingdom, and West Germany. The agreement was signed on **May 30, 1975**, **fifty years ago**. The were able to launch their first satellite on their own that same year, <u>COS-B</u>, a gamma-ray detector.

Four of the ESA member countries also have their own Space programs: Italy, Germany, the UK, and a Spanish consortium, Instituto Nacional de Técnica Aeroespacial.

Today, ESA collaborates often, mostly with NASA but also with the German and Italian space programs, providing instruments and other key components to their partners. ESA considers its mission to be a scientific research organization rather than support crewed missions, but ESA astronauts have flown on both the Space Shuttle and to Russian Space Stations.

ESA is the second-largest purely-civilian Space agency in the world, after NASA, with an annual budget of 1/3 of NASA's (before the present proposed cuts). Other larger agencies, such as JAXA, Roscosmos, are significantly smaller. India, Germany, Italy, and the UAE also have viable Space programs.

#### THE ARIANE SERIES OF ROCKETS

Within five years of its establishment, ESA began launching the first rocket in the Ariane series, now in its sixth successful variant. ESA also builds a smaller rocket (Vega-C) for smaller payloads.

France had lobbied for European countries to work together to develop an expendable rocket system, an enhancement of their own rocket. ELDO had finally come up with a booster design they called "Europa," but even if it worked as designed, it was still too small to fill the perceived need. A too-ambitious plan was proposed, then scaled-back to be acceptable to France and Germany, the program's principal funders. Work would begin before the merger of ELDO and ESRO to form ESA. It was quite a multi-national effort, with the new rockets first two stages being provided by France, its third stage by Germany, and other components provided by the UK, Sweden, and Italy. The product of this joint effort would become known as the "Ariane 1."

From its beginning, ESA's primary focus was to develop its own launch capability for not only scientific mission, but also for commercial launching of satellites as small countries and commercial customers began to realize the value of orbital utilization. ESA was particularly interested in developing a launch system capable of reaching geostationary orbit, which offers attractive qualities to a variety of commercial customers (for more on the mathematics of this particular orbit, see an earlier A+StW Item of the Week <u>here</u>). I plan on writing an Item of the Week this coming October on Arthur C. Clarke and how access to geosynchronous came about.

Work on the Ariane 1 hit a snag in mid-1974, with difficulties in the construction of the rocket's third stage, and ESA incurred a serious investment cost in upgrading its launch facility in Kourou, French Guiana, which slowed the development of Ariane. ESA was also concerned that the American Space Shuttle then under development would capture much of the potential commercial launch business. More concerning was the lack of customers for Ariane launch services, but that issue dissipated when Intelsat corporation committed to launching two Intelsat IV communications satellites on Ariane. ESA then announced its commitment to building at least 10 Ariane 1 rockets.

ESA was under commercial/political pressure to demonstrate the success of Ariane 1 before the "decade was out." The fact that 1980 is technically part of the 1970s was overlooked (as was the case for so many who partied a year too early for the New Millennium on January 1, 2000). A launch attempt was scheduled for December 15, 1979, but technical problems caused a delay. Rather than scrub the launch, they tried again, but the rocket didn't fire at T-minus 0. A new attempt would be made on December 24, and "Ho, Ho, Ho!" the rocket worked as planned. It carried a number of instruments needed for sending rocket performance data back to Earth.

Ten more missions of the Ariane 1 were conducted in the first half of the 1980s. Two were failures, but the other eight were successful. The final two launches were the most notable of the Ariane 1 program. NASA was distracted by its push to utilize the Space Shuttle and projects such as Skylab, and had declined to send a mission to Halley's Comet, at least on its own. NASA did relent a bit, and started working on the International Comet Mission, offering to provide the

Copyright 2025 by Steven H. Williams Non-commercial educational use allowed bus of a spacecraft that would carry an ESA probe. NASA bailed in November, 1989, leaving ESA trying to figure out how to save the mission and find out more for the comet that was on the mind of the public as it approached.

ESA decided to re-purpose two satellites it had in the production line, convert them to be able to study both Halley and another comet in separate fly-bys, and use an Ariane 1 as the launch vehicle. Much of the mission concept came from an Italian scientist named Guiseppe Colombo, whose popular nickname as "Bepi." His reputation at ESA was so well-burnished by this that ESA's spacecraft presently *en route* to orbit Mercury was named for him!

The Ariane 1 design was the basis for the improved Ariane 2, and the development of Ariane 3 progressed in parallel. By the mid-1980s, all three versions became obsolete and were replaced by the fourth and fifth generation, which was used until 2023. The Ariane 6 model is now the only version being built.

The Ariane family of rockets has proved quite successful. The cumulative number of launches of the first five models of Ariane is 261. There was only a cumulative total of 9 failures, and one of those was the first test launch. That's a 252/261 = .966 batting average of success! It will be interesting to see how well the Ariane 6 will do in the orbital service market versus SpaceX's fully-reusable rockets.

#### **ESA PARTNERING**

For fifty years, ESA has been able to design and build satellites and instruments for spacecraft. Over time, ESA's ability to build and launch sophisticated rockets grew to where they routinely offer commercial launch services. The have made significant contributions on a variety of Solar System exploration efforts, their own and in collaboration with NASA, Roscosmos, JAXA, and ISRO. ESA also can build human-rated spacecraft and perform missions with ESA astronauts.

ESA has grown much since its inception, too. Twelve other countries have joined the original eight: Austria, the Czech Republic, Estonia, Finland, Greece, Hungary, Ireland, Luxembourg, Norway, Portugal, Romania, and Slovenia. Four "Non-full Member States participate, too: Canada, Latvia, Lithuania, and Slovakia. ESA has cooperation agreements in place with non-ESA countries, including: Argentina, Brazil, China, India, Russia, and Turkey.

Two months ago, ESA released a strategy paper covering the next 15 years, "ensuring that Space serves Europa in the most impactful and strategic way possible." No doubt it was affected strongly by recent uncertainty in NASA's budget and mission objectives. For more on ESA's Strategy 2040, see: <u>https://spacenews.com/esa-releases-strategy-document-that-emphasizes-autonomy</u>.

#### **ESA ACCOMPLISHMENTS**

In addition to the above-mentioned Ariane family of booster rockets, ESA has accomplished:

With NASA

ESA provided the <u>Huygens Titan Lander</u> for NASA's Cassini mission to Saturn.

ESA contributed to a variety of NASA missions, including but not limited to: the <u>Infrared Space</u> <u>Observatory</u> in the late 1990s; the International Gamma-Ray Astrophysics Laboratory (<u>INTEGRAL</u>) in the early 2000s; the Solar and Heliospheric Observatory (<u>SOHO</u>), still in operation after 30 years; Ulysses, the first spacecraft to be able to examine the Sun's polar regions; and Venus Express

ESA has been an important collaborator with NASA on both the HST and the JWST

ESA was the principal agency for the <u>Rosetta</u> mission to explore Comet 67 P/Cheryumov-Gerasimenko in 2004.

ESA provided the Cupola and Columbus Module for the *International Space Station*, and ESA rockets have flown many cargo missions to the *ISS*.

Mars Express is a 2003 ESA mission to Mars comprising two components, the <u>Mars Express</u> orbiter and the <u>Beagle 2</u> lander. The former is still in operation, sending back data from orbit and serving as a communications relay; the latter failed completely.

ESA launched a spacecraft to study Comet P/Halley, *Giotto*, in 1985, when NASA couldn't.

ESA Looks Down: ESA has developed and launched many Earth observation satellites.

For a complete roster of ESA missions, see: <u>https://www.esa.int/ESA/Our\_Missions</u>

#### **Future Missions**

<u>Ariel</u> (Atmospheric Remote-sensing Infrared Exoplanet Large-survey): Planned for a 2029 launch to survey exoplanet atmospheres from the Earth-Moon L2 point

BepiColombo: Mercury orbiter presently en route to arrive in November, 2026

<u>Clearspace 1</u>: A test of a space debris removal system, planned to capture and return to earth ESA's *PROBA-1* satellite from LEO in 2028.

<u>Envision</u>: A planned Venus orbiter to be launched in 2031, carrying a NASA-supplied SAR imaging system, with the goal of exploring reasons that Venus is Earth's "<u>Fraternal Twin</u>."

*Euclid*: A space telescope designed to study the "dark" Universe, launched in 2023.

*Hera*: A recently launched mission that will measure asteroid deflection test results by visiting the Dimorphos/Didymos system long after <u>Dimorphos was impacted</u> by NASA's *DART* spacecraft.

<u>JUICE</u> (Jupiter Icy moons Explorer): Launched in 2023 to arrive in Jupiter orbit in July 2031 to conduct detailed observations of Europa, Ganymede, and Callisto.

**LISA** (*Laser Interferometer Space Antenna*) is scheduled for launch in 2035, to become the first gravitational wave detector to be sent into interplanetary space.

**MOONLIGHT** will be a satellite constellation that will support telecommunications and navigation services to upcoming missions to the Moon.

<u>Newathena</u> will be the largest X-ray satellite observatory yet built, scheduled for a 2037 launch and insertion into the Earth-Sun L1 point.

**PLATO** (PLAnetary Transits and Oscillations of stars) is planned for a 2026 launch on a mission to the Sun-Earth L2 point where it will search for exoplanets.

### ADDITIONAL REFERENCES

ESA: <u>https://www.esa.int</u> 50 Years of ESA: <u>https://www.esa.int/About\_Us/50\_years\_of\_ESA</u> Discover ESA: <u>https://discover.esa.int/#/en</u> Planetary Society: <u>https://www.planetary.org/the-european-space-agency-esa</u> Wikipedia: <u>https://en.wikipedia.org/wiki/European\_Space\_Agency</u> Space.com: <u>https://www.space.com/22562-european-space-agency.html</u>

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