

Europe's Ariane woes



With the retirement of Ariane 5, Europe lost its only heavy-lift rocket – one that carried most of ESA's fleet of large astronomy missions. The long-term future of independent access to space for Europe is not straightforward and can complicate the European space exploration roadmap.

On 5 July 2023, flight number VA-261 marked Ariane 5's last mission. Thus concludes the career of a vehicle that spanned 27 years and 117 launches. It is difficult to overstate the importance of the Ariane 5 programme. It allowed Europe and ESA to obtain some independence from American and Russian rockets, and it dominated the geostationary global launch market, giving Europe an edge in an increasingly competitive market. Ariane 5 has also been a very reliable workhorse, with a success rate of 95.6% despite a rocky start (4 of the first 14 launches, including the maiden flight, were failures or partial failures).

Even though the majority of its payloads have been in telecommunications, Ariane 5 has provided a significant contribution to astronomy and planetary exploration, particularly European. Most famously, it was charged with launching JWST in December 2021, but most ESA cornerstone missions, as well as its only large (L-class) mission launched so far (Juice, on Ariane 5's penultimate flight), have also been on an Ariane 5 (see Table 1). Only SOHO, launched before Ariane 5 came into operation, and Gaia, on a Soyuz, are not included in the tally (Cluster 2 was successfully launched on a Soyuz after the ill-fated first attempt).

Celebrations of the retirement of a successful programme are always bittersweet, but Ariane 5's case is especially poignant and highlights some of Europe's structural weaknesses

Table 1 | Astronomy and planetary missions with Ariane 5

| Mission | Scientific objective | Year of launch |
|-----------------|--|--|
| Cluster | Earth magnetosphere | 1996 (maiden flight, critical failure) |
| XMM-Newton | X-ray observatory | 1999 |
| Rosetta | Comet 67P orbiter and lander | 2004 |
| Herschel/Planck | Far-infrared observatory/cosmic microwave background mapping | 2009 |
| BepiColombo | Mercury orbiter | 2018 |
| JWST | Near- to mid-infrared observatory | 2021 |
| Juice | Jupiter system orbiter | 2023 |

concerning space. In fact, with the phasing out of Ariane 5, Europe and ESA lose their only heavy-lift rocket, and with that, independent means to deploy large satellites. The situation is made even more difficult by the indefinite grounding of their only medium-lift rocket Vega-C after a launch failure at the end of 2022. Ariane 5's successor, Ariane 6, was supposed to have its inaugural flight this year after a series of delays, but further problems pushed it to at least 2024. In the meantime, Europe is lagging behind in terms of launches: only 2 of the 115 that happened across the globe in 2023 so far have been European.

The situation is critical enough that ESA's director general Josef Aschbacher spoke of an "acute launcher crisis" for Europe. More worryingly, he also mentioned the lack of launcher vision beyond 2030, indicating that the issues are structural and go beyond Ariane 6's delays. Europe is being criticized for the lack of innovation in the planning of new rockets, as well as for missing their chance on reusable rocket technology (both Ariane 6 and Vega-C are expendable rockets) and not having fostered the emergence of innovative companies like SpaceX. In addition, the cost per launch of Ariane 6, while substantially lower than Ariane 5, still compares unfavourably with other choices on the market.

This situation has immediate and practical implications for European astronomy and space exploration. A direct and explicit symbol of this vulnerability has been the launch of a fully European mission, the dark Universe explorer Euclid, on a... SpaceX Falcon 9 vector from Cape Canaveral on 1 July 2023. Having independent access to space goes beyond mere prestige. It guarantees some degree of immunity to world events, as the Russia–Ukraine war and the related sudden unavailability of Russian rockets has demonstrated. It also reduces the risk of further delays due to the lack of rocket availability or scheduling complications.

The arrival of Ariane 6, which should happen next year, will provide some relief. There are reasons to be optimistic: a dress rehearsal in mid-July 2023 was successful, which keeps the launcher on track for 2024. A series of astronomy missions have already been scheduled, starting with exoplanet-dedicated PLATO in 2026. However, a consistent strategy is needed for Europe, and our community should not feel detached or uninvolved, as it will affect our observation and exploration capability in a non-negligible way.

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