The Vinci cryogenic engine by Safran is designed to power the upper stages on Ariane 5 ME* and the future Ariane 6. Jean-François Delange, who runs the Ariane development programs at the Snecma (Safran) Space Engines division, told us more.

What is the point of using the same engine for Ariane 5 ME and Ariane 6?
You need to understand the launcher market to answer that question. The Vinci propulsion system was originally designed to boost the future Ariane 5 ME launcher's power, because satellite payloads were getting heavier. Its 40,000-lb thrust—which is three times more than the HM7 engine in use today—will do exactly that.

At the turn of the decade, however, newcomers disrupted the launcher market. So, at the end of 2012, European ministers in charge of space decided to push ahead with the Ariane 5 ME program and kicked off plans to create a new low-cost launcher, Ariane 6, to replace the Ariane 5 family flying today. They also decided that the same Vinci propulsion system should power the upper stages on both these launchers, to limit Ariane 6 development costs. We met the ESA and Astrium several times, and showed them that our engine matches their specifications.

What puts the Vinci engine in a class by itself?
Its main new feature is that this engine can restart. So it can handle a variety of missions (GTO, LEO, transfer orbit, etc.) and can do something both launchers need to do: it can tip upper stages off their orbits. We need to do that to send those stages back to Earth, to limit the number of large pieces of debris floating around in space.

That is a big issue today, because the amount of debris is swelling non-stop, and it could damage or destroy satellites in orbit.

The Vinci engine’s other distinctive feature is its extendible nozzle. It folds away for launch, and unfolds when the upper and main stage separate. This feature was a sine-qua-non for Ariane 5 ME, which has a slightly taller upper stage than Ariane 5, to use the existing final assembly building at the Guiana Space Centre. A new assembly building will be erected for Ariane 6, so we will not need the nozzle extension system for it.

The economic challenge is one of our main concerns today. The Vinci engine is purpose-designed to cost requirements. That is why we chose an “Expander” cycle. This technology sidesteps specific gas generators, as opposed to our other engines. We have also packed many technological breakthroughs into this engine, including powder metallurgy and additive manufacturing, to optimize operating cost-efficiency even further.

A new test campaign is now underway. What is the goal?
This test campaign started in early August and will put us in a position to validate the technical definitions and concepts in Vinci’s various subsystems. The first four tests on this campaign were successful, confirming this engine’s technical maturity.

This is the fifth engine we have subjected to test benches since 2005. We will run the next two tests to qualify the subsystems by exploring the edges of their envelopes under extreme conditions, and the following two to qualify the engine before it enters service on Ariane 5 ME, which is due to launch for the first time in 2018.

Over the coming eight months, we will run a dozen firing tests, to test the nozzle in flight configuration for the first time.

*The Vinci engine is expected to enter service on Ariane 5 ME in 2018.*

• Watch the video about the Vinci engine