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Roger Blaser, 8 February 2012

Factsheet

First launch of Vega rocket from European Space Port in French Guiana

Monday 13 February 2012 will be a momentous occasion for the European space industry.

Developed by the European Space Agency (ESA), the Vega launcher will complement the range of launchers operated from the Guiana Space Centre (CSG) in Kourou, French Guiana. Vega meets the need for small payloads to be placed into orbit at low cost. With the heavy launcher Ariane and the medium launcher Soyuz, Vega now joins a family of French Guiana-operated launchers to provide Europe with guaranteed access to space.

There has been a recent revival of interest in small satellites. The launcher is designed to cope with a wide range of missions and payload configurations, making it flexible enough to respond to different market opportunities. The fourth stage of the Vega launcher can be restarted up to five times. This is a major competitive advantage since it not only enables correction of deviations in trajectory caused by the lower stages, but also allows several payloads to be placed into different orbits.

This "premier" marks the culminating point of the ESA's "Vega European Small Launcher" programme, which Switzerland fully took part in. This programme will be followed by the "Vega Research and Technology Accompaniment (VERTA)" programme.

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VEGA

Italy proposed Vega to the ESA, which adopted it on 25 March 1998. Switzerland has contributed to the Vega launcher from the very beginning, together with France, Spain, Belgium, the Netherlands and Sweden. The contracts for development of the Vega launcher and the P80 engine were signed in February 2003. The launch pad and infrastructure of the CSG's ELA-1 complex, which was originally used for the Ariane 1 and 3 launchers, was adapted to

meet the requirements of the Vega launcher. After the qualification flight, the Vega launcher will be operated by Arianespace, which already operates Ariane and Soyuz from the CSG.

- On 4 October 2011, the flight aptitude review gave the green light for the first launch campaign. The VV01 qualification flight has now been scheduled for 13 February 2012. The launch window is small and a delay of more than one day would result in postponement of the Vega qualification flight until after the launch of the third automated transfer vehicle (ATV-3), which is scheduled for 9 March 2012.

Description of Vega

The Vega launcher offers configurations that can handle payloads ranging from a single satellite to one main satellite plus eight microsatellites.

- Payload masses ranging from 300 kg to 2,500 kg, depending on the type of mission and orbit required
- Benchmark mission: 1.5-tonne payload placed in a 700 km-altitude polar orbit;
- Low development costs, use of existing technology
- Three solid-propellant stages: a P80 engine for the first stage; a Zefiro-23 engine for the second stage, a Zefiro-9 engine for the third stage. The Zefiro engines are based on the Zefiro-16, which was developed by Avio S.p.A. and include new lightweight materials (carbon-filament epoxy with EPDM insulation)
- Fourth liquid-propellant stage: the Attitude Vernier Upper Module (AVUM), which can be restarted up to five times. This gives the launcher a significant competitive advantage
- Synergies with Ariane 5, P80 booster and ground segment;
- Mass at lift-off: 137 tonnes.

Swiss participation in Vega programme

The launchers sector and guaranteed access to space have always been priorities for Switzerland. Expenditure in this sector has led to the success of Swiss fairings for Ariane rockets and soon also for Vega rockets. Swiss involvement in the Vega programme will enable industries to become more competitive on the three launchers Ariane, Soyuz and Vega thanks to synergies at the CSG.

Switzerland's commitment amounts to 1.25% for the Vega programme and 1.5% for the VERTA programme. Swiss industry can expect a sizeable recurrent return on this investment.

For the full Vega launch, the company APCO technologies (http://www.apco-technologies.ch) provided the payload preparation units and the means to maintain the Zefiro-equipped stages. For its part, RUAG Space Switzerland was involved in the launch campaign (http://www.ruag.com/space/ch).

- Swiss contribution
  - The fairing, which is currently being standardised to accommodate all small satellites, RUAG;
  - The means of maintaining Zefiro-equipped stages, the operational protection equipment for the entire Vega launch, APCO;
  - The safe and arm device for electric ignition lines (e-SAD), which will be used on the first VERTA flight, RUAG;
  - The instrumentation vibration/development pressure and recurrent flights, Meggitt;
  - The Vega Research and Technology Accompaniment (VERTA) programme covers five flights intended to certify the launcher. These flights will enable testing of all mission configurations and the multiple payload adaptor. They will also enable planning and management of obsolescence as well as demonstration of specific missions and flexibility.

New technological developments

- RUAG has developed a new "safe and arm device for electric ignition lines (e-SAD)", which enables the safe electrical ignition of the fairing's pyrotechnical control system prior to launch. This new system meets very stringent standards to ensure the safety of personnel at the launch site. Once qualified on the first VERTA flight, it will also be used on the Ariane 5.
- The P80-equipped first stage of the Vega launcher has the same 3-metre diameter as the boosters used in the first stage of the Ariane 5. The stage casing is much lighter since it is not made of steel but rather carbon fibre pre-impregnated with epoxy resin. The thermal protection between the casing and the propellant is a new lightweight rubber developed by Avio.
- The new on-board computer has a space processor with a computing power of 13 Mips. Eventually, this on-board computer will also be installed on the Ariane 5.

First payloads

The primary payload of Vega's VV01 qualification flight will be the Italian laser relativity satellite (LARES), which weighs 400 kg. There will also be 8 other small satellites to be released at an altitude of 1,400 km.
Developed by the Italian Space Agency (ASI), LARES is a passive geodetic satellite with 92 laser retroreflectors that will receive signals from ground stations. The aim is to measure the Lense-Thirring effect, which was discovered by Joseph Lens and Hans Thirring, with a precision below 1%. This effect is also called "frame dragging" or "gravitomagnetism" and is part of Albert Einstein’s theory of general relativity, which describes the distortion of space-time caused by the rotation of a body with mass.

- The VV01 qualification flight will carry 1 microsatellite and 7 picosatellites:
  - ALMASat-1 University of Bologna (IT) 12.5 kg, (ALma-MAtter Satellite) is intended to demonstrate the capabilities of an Earth observation microsatellite
  - UniCubeSat GG Universtiy of Rome La Sapienza (IT), (mission to study the Earth's gravitational field)
  - CubeSat e-st@r Politecnico de Torino (IT), (mission to test attitude control system)
  - CubeSat Robusta University of Montpellier (FR), (mission to measure radiation effects on bipolar transistors)
  - CubeSat Xatcobeo University of Vigo and INTA (ES), (mission to demonstrate software-defined deployment of radio antenna and solar panel)
  - CubeSat PW-Sat Warsaw University of Technology (PO), (mission to test a deployable atmospheric drag augmentation device for deorbiting CubeSats)
  - CubeSat Goliat University of Bucarest (RO) (mission to take images using a digital camera and measure radiation and micrometeoroid flux *in situ*)
  - CubeSat MaSAt-1 Budapest University of Technology and Economics (HU), (mission to test avionic equipment)

Additional information:

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