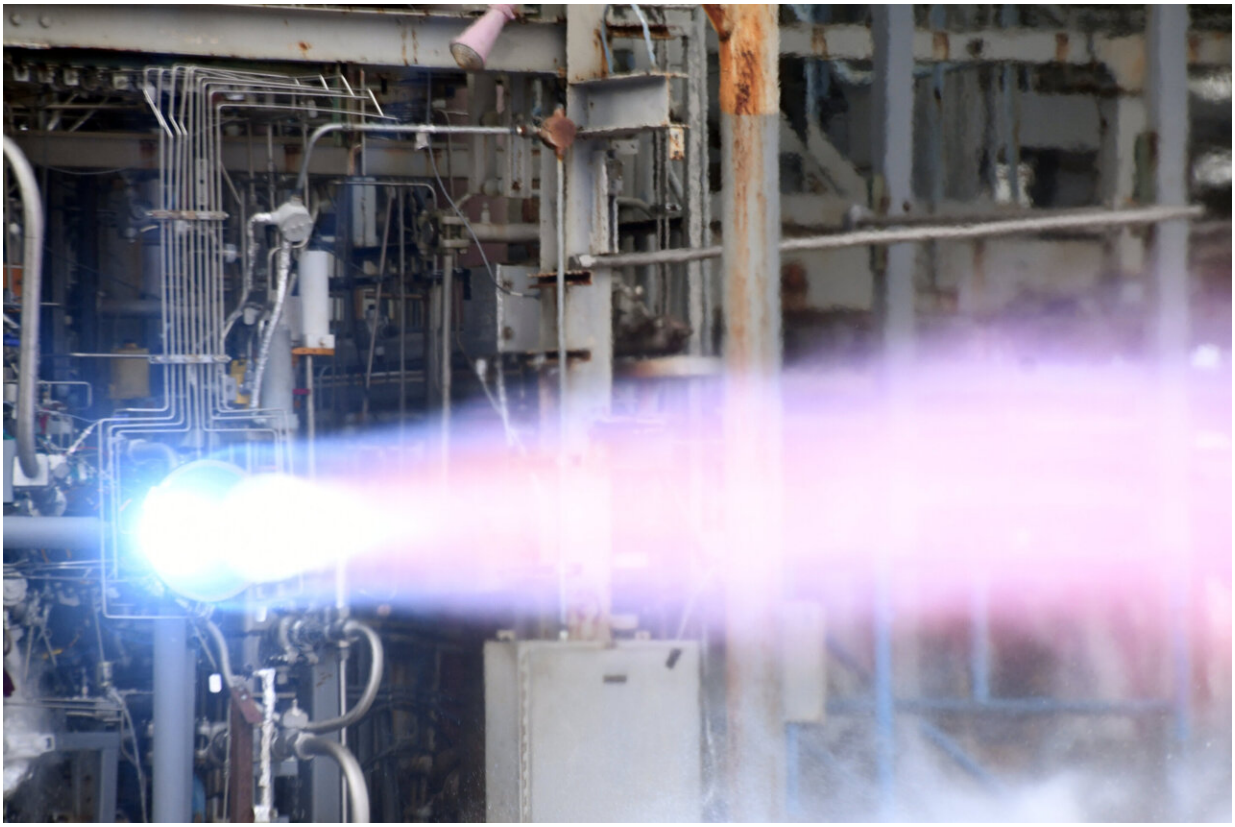
3-D-printed thrust chamber passes first tests for vega evolutions

March 4 2020



The 3D-printed thrust chamber assembly of the methane-fuelled M10 rocket engine passed its first series of hot firing tests at the NASA Marshall Space Flight Center in the USA during February 2020. The M10 engine will power the upper stage of future Vega evolutions from 2025. Credit: ESA/NASA

The 3-D-printed thrust chamber assembly of the methane-fueled M10

rocket engine has passed its first series of hot firing tests. The M10 engine will power the upper stage of future Vega evolutions from 2025.

"These test results are encouraging, confirming that our propulsion teams are right on track along the development path identified for such novel technology for Vega evolutions," commented Giorgio Tumino, managing ESA's Vega and Space Rider development programs.

M10 will improve propulsion efficiency and environmental sustainability by reducing emissions and combustion waste thereby increasing the competitiveness of European small launchers and lowering their cost.

The M10 is restartable and uses a system of smart pressure control. This improves fuel management and offers mission flexibility.

Avio in Italy built this TCA in two parts via additive layer-by-layer manufacturing (ALM) using metal alloys, then welded the two parts together. ALM enables more complex internal geometries to be built in fewer parts with a reduced need for additional machining, which benefits cryogenic technology, speeds up production time and cuts costs.

M10 is a 10 t-class liquid oxygen-methane expander cycle engine, intended to replace the second and third stages (Zefiro 9 solid-propellant motor and AVUM upper stage) of the current Vega configuration.

ALM with metal alloys has become more reliable and of better quality but product inspection is challenging. Non-destructive inspection (NDI) such as tomography and ultrasound is used to detect defects, geometry distortions and potential obstructions within cooling channels.

Subscale models demonstrated in 2018 that ALM produces thrust chambers that are comparable to those built in the traditional way and that NDI was successful in detecting defects during manufacturing. This

opened the way for the development of the full-scale ALM thrust chamber.

During this test campaign, the TCA was fired 19 times for a total of 450 seconds at the NASA Marshall Space Flight Center in the U.S..

By comparing this data with the results from previous models, engineers will better understand the engine behavior and performances in the up-scaled model. This will help to optimize the configuration of the first M10 development model.

The hot firing of the first development model of the M10 engine will be carried out at the end of the year. Ground qualification is foreseen for 2024 followed by its use in future Vega launch vehicles by 2025.

"These tests prove new technologies and methods that will keep Europe competitive in the launch services market into the future," added Stefano Bianchi, Head of the Space Transportation developments at ESA.

Provided by European Space Agency

Citation: 3-D-printed thrust chamber passes first tests for vega evolutions (2020, March 4) retrieved 27 April 2024 from https://phys.org/news/2020-03-d-printed-chamber-vega-evolutions.html