

LIROC

Laser Ignition Technology for Rocket Engines

LAUNCHING ROCKETS MORE EFFECTIVELY

Seen from Earth, a rocket is fired once. Yet, beyond the scope of the human eye, in the upper atmosphere it takes the form of a series of further launches. The LIROC project explores how new laser technology can enhance the quality of these “upper stage launches” further.

Minutes after its launch, travelling through the upper stages of the atmosphere, modern rockets are fired numerous times. Indeed, a rocket is a series of rockets stabled on top of each other, and the firing of the upper stages of such rockets is a challenging exercise.

In order to secure that these upper stage launches are undertaken precisely when it is most optimal for the spacecraft to be deployed safely in its orbit, laser technologies have emerged as possible means to enhance current state-of-the-art.



rocket takeoff © Stephen Sweet - Fotolia.com

LIROC explores how laser ignition may be initiate combustion during the upper stages of rocket launches.

Ignition processes are complex as they occur during engine transient phases during which flow behaviour is constantly undergoing changes. Mastering such processes is of paramount importance to ensure successful ignitions which are repeatable within minimal margins. As launcher upper stages soar through the upper layers of the atmosphere, environmental conditions change, inducing changes in the stage engine. Re-ignition becomes challenging as each ignition occurs under different conditions but must satisfy the same stringent requirements.

Laser technologies have emerged as possible means to solve this challenge. The LIROC project therefore addresses such technologies with a view to exploring how they may be used to initiate combustion in the cryogenic upper stages of launch vehicles.

LIROC explores how lasers may be focused inside the main rocket combustion chamber, in order to initiate the firing of the upper stages of the rockets.

Even a slight increase in the performance of upper stages launches will have a significant impact on how much payload a rocket is able to carry into orbit.



MICHAEL OSCHWALD
IS PROJECT COORDINATOR

QUESTIONS & ANSWERS

What do you want to achieve with this project?

To examine how a laser system can be implemented to successfully ignite upper stage liquid rocket engines both reliably as well as reproducibly, and in doing so to pave the way for the implementation of laser systems to improve current European launch capabilities and thus enhance Europe's leading role.

Why is this project important for Europe?

Unlimited and reliable access to space is of fundamental importance to ensure the sovereignty of Europe in the world. Scientific advances and economic proliferation are of utter importance and space related research plays an important role in ensuring the latter. LIROC aims at enhancing and improving Europe's access to space.

How does your work benefit European citizens?

In today's world, European space technologies both directly as well as spin-offs enhance the quality of life of Europe's citizens. Improving of ignition systems is of fundamental importance to improving of launcher capabilities and thus ensuring and improving this quality of life.

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LIST OF PARTNERS

- Deutsches Zentrum für Luft- und Raumfahrt (DLR), Germany
- Aerospace Propulsion Research (APP), The Netherlands
- SSC Keldysh Research Centre (KeRC), Russian Federation
- Konstruktorskoe Buro Khimavtomatikiy (KBKhA), Russian Federation

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PROJECT INFORMATION

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