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Abstract #XXX (to be filled by the organizers)

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Corresponding author: FISCHER, Jan-Steffen

e-mail of corresponding author: [fischerj@irs.uni-stuttgart.de](mailto:fischerj@irs.uni-stuttgart.de)

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### Title

## Comparison Study on the Environmental Impact of Different Launcher Architectures

### Authors

Jan-Steffen Fischer <sup>1\*</sup>, Stefanos Fasoulas<sup>1</sup>, Céline Brun-Buisson<sup>2</sup>, Dr. Encarna del Olmo<sup>2</sup>

\* Corresponding author

<sup>1</sup> University of Stuttgart, Institute of Space Systems, 70569 Stuttgart, Germany, [fischerj@irs.uni-stuttgart.de](mailto:fischerj@irs.uni-stuttgart.de),

[fasoulas@irs.uni-stuttgart.de](mailto:fasoulas@irs.uni-stuttgart.de)

<sup>2</sup> ArianeGroup SAS, 78131 Les Mureaux, France, [celine.brun-buisson@ariane.group](mailto:celine.brun-buisson@ariane.group), [encarna.delolmo@ariane.group](mailto:encarna.delolmo@ariane.group)

### Abstract

In 2022, a new record was set for the second year in a row with 178 successful orbital launches out of 186 launch attempts. A further increase is expected in the coming years due to the growing demand in space launch capacities for satellite constellations.

Against the background of this growth as well as climate change and the impact of human activities on the planet, this analysis takes a closer look on the environmental impact of the production of launch systems and their propellants.

The paper first defines different typical target orbits and payload masses as a framework for this study. In the following step, different launcher system architectures are designed with common design formulas to compare their environmental impacts and the masses of the subsystems and dimensioning of the tanks are carried out. Staged systems of different types and numbers as well as different propellant concepts will be considered.

With the help of the generic environmental indicator data for the different subsystems determined by ArianeGroup on the basis of Ariane 6 production the overall impact of the launcher system is then estimated.

In the final step, the different environmental impacts are evaluated and different launcher architectures and propellant systems are compared. This is done based on the two functional units per ton payload and depending on one launch into the target orbit. The work is intended to contribute to making space transport greener.