# Cooperative Concurrent Design Optimization of a Krueger High-Lift System

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Within the EU UHURA project[1], the need emerged to design a folding bull nose Krueger device as the target configuration for studying unsteady aerodynamic effects during deployment and retraction of such a system. Consequently, the design objective of generating as much as possible lift force was subject to the heavy and demanding constraint of being adequately integrated into existing wind tunnel models. Hence, the design specifications require a high-performance Krueger device that doesn't exhibit artificial flow effects besides offering high-performance. This constraint is more important than getting the ultimate performance in terms of maximum lift.
As a starting point, the design experience obtained in previous projects, DeSiReH [1] and AFLoNext [2], has been used to generate an initial Krueger shape. Hence, the characteristic design parameters of the Krueger device obtained in DeSiReH have been mapped to the DLR-F15-LLE geometry [3].
The design of the Krueger flap has been obtained by a cooperative concurrent engineering approach between two UHURA partners, namely CIRA and DLR, in an iterative process. In a first loop, independent optimizations were performed based on the partner's best practice methods. Afterwards, the designs were merged by selecting beneficial aspects of both optimization results. Finally, the design was adapted to respect refined kinematics constraints.
The synthesized design achieves all requirements from kinematics and achieves a high level of maximum lift coefficient. For the final design, aerodynamic forces have been derived for the Krueger panel and the bull-nose to support kinematics sizing.

## REFERENCES

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