

IAC-20-D6.3.5

Spaceport Concept in Germany

S. Kaltenhäuser¹, C. Klünker¹, D.-R. Schmitt^{1*}, M. Sippel², J. Veth³, K. Zimmermann⁴,
A. H. Lockheed Jr.⁵, J. R. Strom⁶

¹*DLR, Institute of Flight Guidance, Braunschweig, Germany*

²*DLR, Space Launcher System Analysis, Bremen, Germany*

³*DLR, Trauen Research Center, Trauen, Germany*

⁴*GEPARD-Aerospace GmbH, Trauen, Germany*

⁵*Allan Lockheed & Associates, Golden, Colorado, USA*

⁶*Economic Strategies LLC, Denver, Colorado, USA*

* Corresponding Author

Abstract

DLR and partners have conducted a study to establish a spaceport in Germany. This study includes topics as the market situation/demand/viability, safety and security for the integration of operations into the airspace, the necessary licensing, the operational requirements, as well as the regulatory framework.

Keywords: Spaceport, Air & Spaceport, Rostock-Laage, Airlaunch

1. Introduction

In mid-2019, the Ministry of Energy, Infrastructure and Digitization of Mecklenburg-Western Pomerania, in coordination with the Ministry of Education, Science and Culture of Mecklenburg-Western Pomerania, commissioned the German Aerospace Center (DLR) with a study to prove the basics of a safe and economic spaceport operation of Rostock-Laage as well as a possible network with other locations in Northern Germany.

2. Material and methods

For the execution of this study the DLR contributed interdisciplinary knowledge from its aerospace fields. The results of DLR's own scientific investigations and simulations as well as the results of literature studies have been incorporated. External experts from the field of aviation and the licensing of US-American spaceports were also involved in the preparation of the study. In order to obtain the necessary information, talks were also held with representatives of the Rostock-Laage airport, the German Federal Armed Forces at the Laage site and with possible commercial launch providers.

3. Results

In this study especially the suitability of the airport Rostock-Laage as an "Spaceport" is examined and evaluated. Due to the different parameters, such as the geographical location and the existing infrastructure, the study focused on the possible use of Rostock-Laage as "Spaceport" for horizontal take-off and landing, i.e. as an "Air & Spaceport". Such airports, which allow these

operational concepts, are considered to be of greater economic importance for the future, especially since the establishment of an Air & Spaceport has generally proven to be stimulating for the economic development of a region [1].

The study therefore focused on the airlaunch of



Fig. 1. Proposed Air & Spaceport Rostock-Laage
Source: *Airliners.net* (Photo: *Konstantin von Wedelstaedt*)



Fig. 2. Generic model of an airlaunch system
Source: *DLR*

rockets and spacecraft for orbital and suborbital missions as well as the return of reusable spacecraft.

The study was able to show a basic suitability of the location for these mission variants. The airlaunch of small satellites into polar orbits (launch site over the North Sea) appears to be particularly promising, as a corresponding system could be available in the near future.

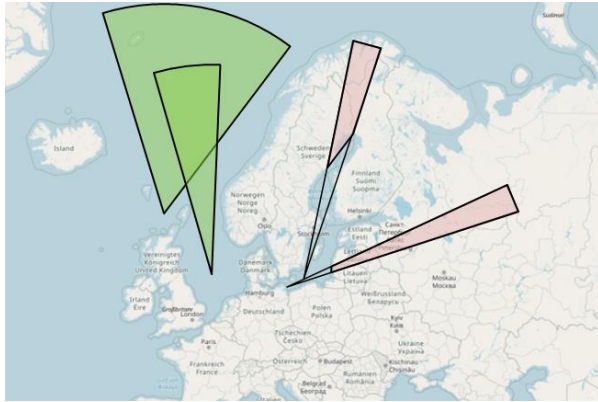


Fig. 3. Polar and sun-synchronous orbits are possible from areas over the North Sea. Launches are not feasible over the Baltic Sea due to overflowed land.

Source: DLR, Map by OpenStreetMap and OpenStreetMap Foundation



Fig. 4. Possible flight plan starting at Rostock-Laage for launch area North Sea, takeoff alternate: Nordholz
 Source: Gepar Aerospace

The airport brings with it the basic requirements for the establishment of an Air & Spaceport. The efficiency of an Air & Spaceport Rostock-Laage could possibly be increased by the vision of a network by complementary use of existing strengths and expertise of other locations in Northern Germany.

The necessity for the development of sustainable, efficient and safe regulatory framework conditions for the execution of orbital and suborbital space flights in Germany was also pointed out [2]. In case no European or German Space Law will be implemented soon, the approval and licensing for missions should be made on a case-by-case decision of by the authorities.

It is proposed to carry out a pilot project with the aim to prepare the realization of a first launch by 2023.

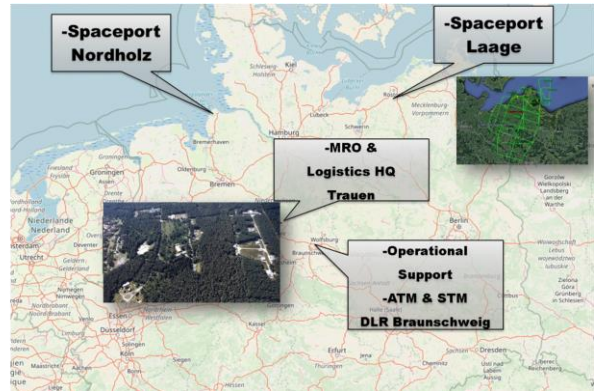


Fig. 5. Vision of a German Spaceport operational network

Source: Map by OpenStreetMap and OpenStreetMap Foundation;
 Small map/image: AIP Germany, Image Landsat/Copernicus, GeoBasis DE/BKG, DataSIO, NOAA, U.S. Navy, NGA, GEBCO, Google; aerial picture: DLR

6. Conclusions

Requirements for an Air & Spaceports have been investigated for airport Rostock-Laage, Germany. The results show that this facility is feasible to become Germany's first Air & Spaceport. Important will be the implementation of a new Space Law in Germany. First pilot missions are proposed for 2023 ff. The vision of the proposed German network of facilities and Spaceports should be further investigated in order to use existing infrastructures effectively [3].

Acknowledgements

The fruitful discussions for the purposes of this study with the Airport Rostock-Laage, the German Armed Forces at Rostock-Laage, the Government authorities from the State of Mecklenburg-Western Pomerania, and the German regulatory authorities DFS and LBA are appreciated.

References

- [1] D.-R. Schmitt, S. Kaltenhäuser, Jürgen Drescher, Does only innovation stimulates New Space? IAC-19-E6.3.13, 70th International Astronautical Congress 2019, Washington, DC, USA, 21.-25. October. 2019.
- [2] J.-L. Ammeloot, J.-B. Marciacq, Accommodating Sub-orbital and Orbital Aircraft (SOA) flights in the EU, Briefings to the ICAO Air Navigation

Commission (ANC) and ICAO Council , 21st of
October 2013, Montreal.
[3] S. Kaltenhäuser, C. Klünker, D.-R. Schmitt, M.
Sippel, J. Veth, K. Zimmermann, A. H. Lockheed Jr.,
J. R. Strom, Machbarkeitsstudie Weltraumflughafen

Rostock-Laage, 16 September 2020,
[https://www.regierung-
mv.de/Landesregierung/em/Infrastruktur/Luftverkeh
r/weltraumflughafen/](https://www.regierung-mv.de/Landesregierung/em/Infrastruktur/Luftverkehr/weltraumflughafen/) (accessed 01.10.20).