



GERMAN
OFFSHORE SPACEPORT
ALLIANCE

GOSA – AN EUROPEAN OFFSHORE SPACEPORT FOR MICROLAUNCHERS & SMALL SATELLITES

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36TH ANNUAL SMALL SATELLITE CONFERENCE, LOGAN, USA, 11TH AUGUST 2022

SSC22-XI-08

THE NEWSPACE MARKET

- More than 100 Minilauncher projects and initiatives have been announced worldwide since the 2000s.
- Several promising projects in Europe: HyImpulse, ISAR Aerospace, PLD, Rocket Factory Augsburg, Skyrora, Orbex.
- Minilaunchers are interesting for small satellites (< 500 kg).
- 2020-2029:
 - Studies foresee 12500 -14000 satellites to be launched;
 - 90% are small satellites (< 500 kg);
 - 27% are Mini-Sats (<50 kg);
 - Domination of commercial constellations like OneWeb and Starlink.

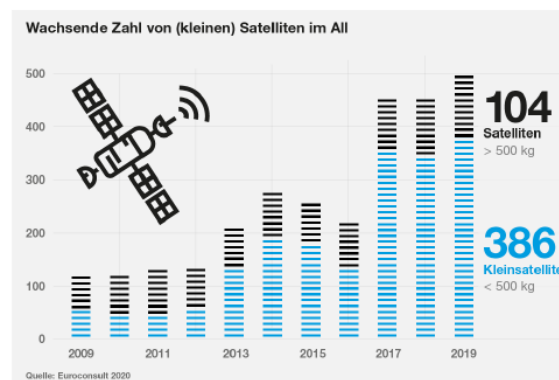
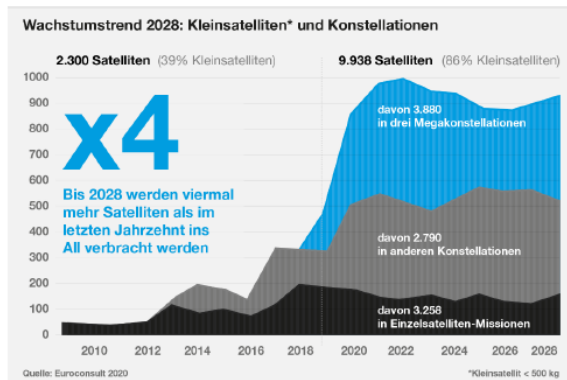
The collage features several key elements:

- Tagesschau Article:** A screenshot from the German news outlet 'tagesschau' with the headline 'Was will Porsche im Weltall?' (What does Porsche want in space?). The article, dated 28.07.2021, reports that Porsche Holding SE is entering the space business, with Volkswagen's parent company participating in the Munich-based rocket manufacturer Isar Aerospace. A small image of a rocket launch is visible.
- Newspace Industry Report Germany 2020:** A cover for a report by the German Business Association (BDI) and the German Aerospace Establishment (DLR). The cover features a satellite in orbit over Earth and the text 'NEWSPACE INDUSTRY REPORT GERMANY 2020'.
- Griff nach den Sternen:** An article titled 'Griff nach den Sternen' (Reaching for the Stars) from 'tagesschau'. It discusses how satellite data connections will have a significant impact on the future of cars, with the headline 'Für die vernetzten Autos der Zukunft haben Datenverbindungen über Satelliten eine große Bedeutung' (For the networked cars of the future, data connections via satellites have a great importance).



THE NEWSPACE MARKET

- Market accessible for Minilaunchers launched in Europe is around 25% (or ~ 3500 satellites) due to constellation batch launches and regional restrictions.
- European institutional and commercial small sat market is increasing and could increase the forecast.
- Around 65% of those satellites have Polar respectively SSO orbits and can directly be addressed with the offshore spaceport with the launch location in the North Sea

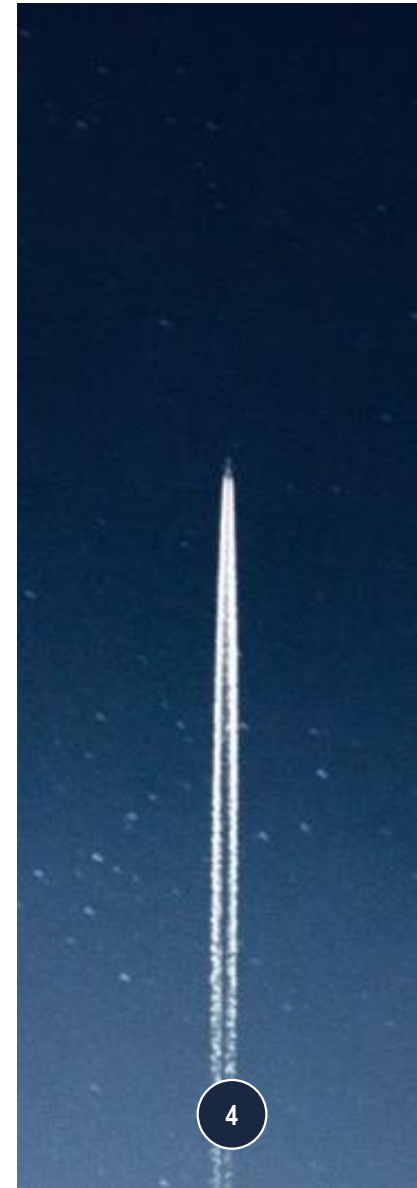


THE PROJECT

In December 2020 the operator German Offshore Spaceport Alliance (GOSA) based in Bremen, Germany, was founded for the purpose to offer efficient launch options for small launch vehicles with an offshore vessel that takes our customer's needs into account and enables payloads of up to about 1 ton* to be launched from the German economic exclusive zone at the „Entenschnabel“ within a few days.

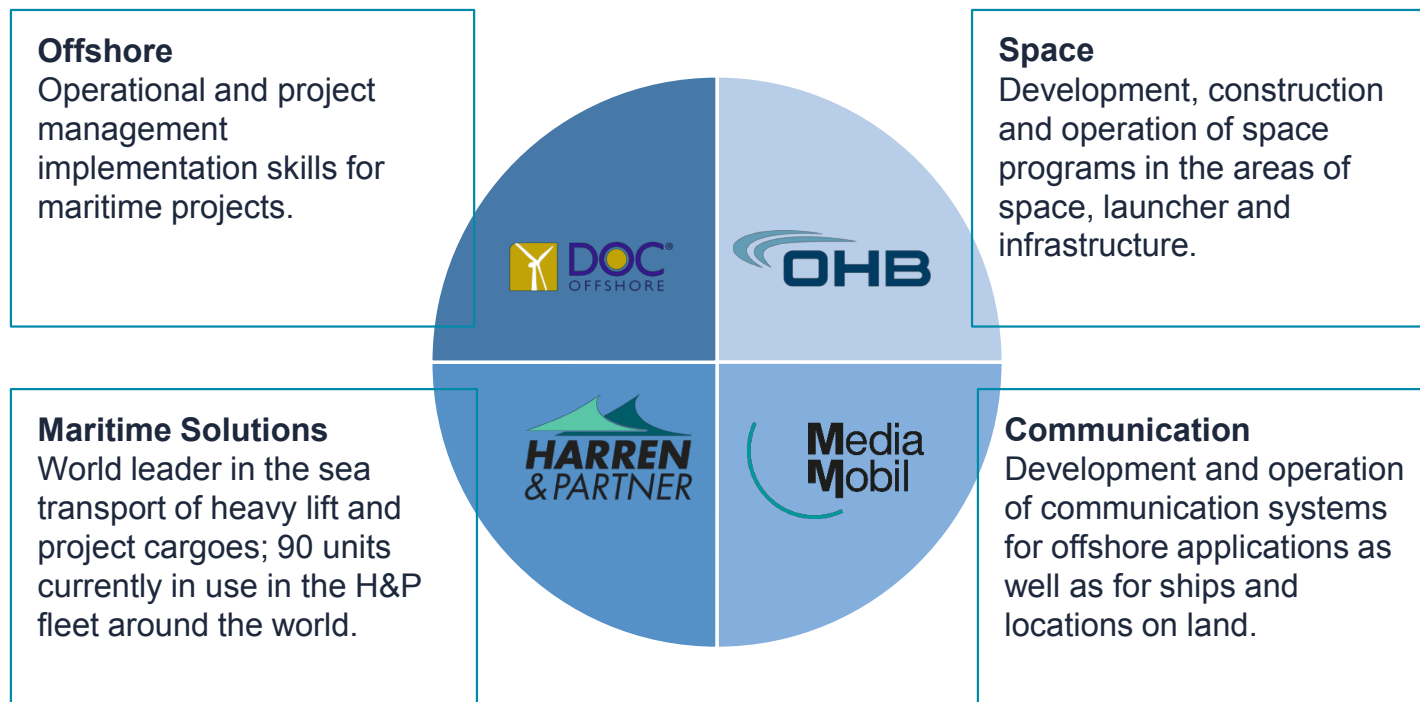


*metric system



PARTNER

The partners of the German Offshore Spaceport Alliance joined forces on the basis of their unique competencies in their respective fields of activity.

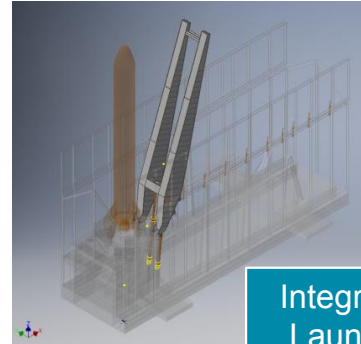


OFFSHORE SPACEPORT CAMPAIGN



Integration Launcher + Satellite

Landbased Campaign
~10-20 days
(depending from Launcher)



Integration Launch + Launch Box

Maritime Campaign
2-7 days
(depending from Weather + Launcher)

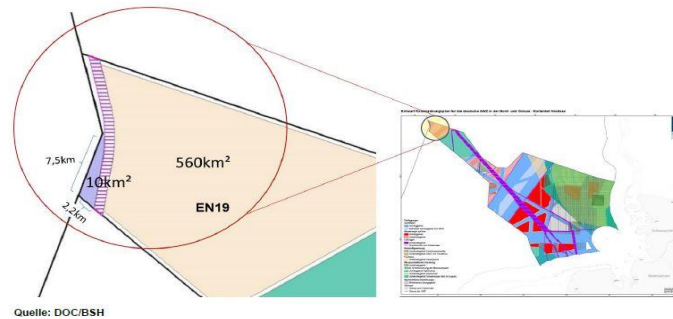
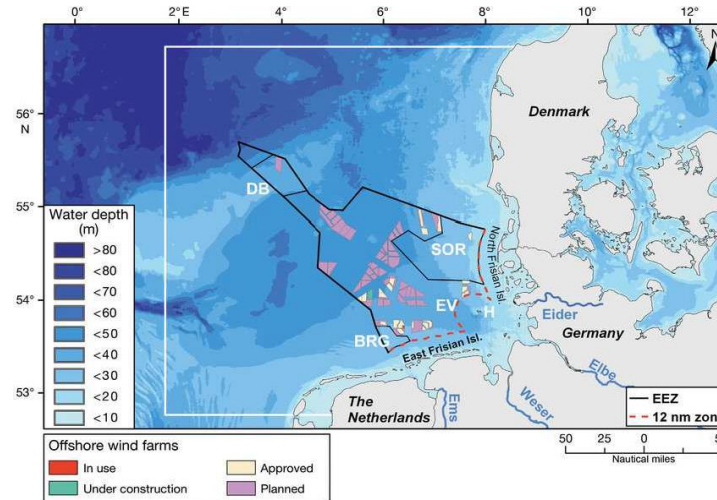


Roll-in Launch Box



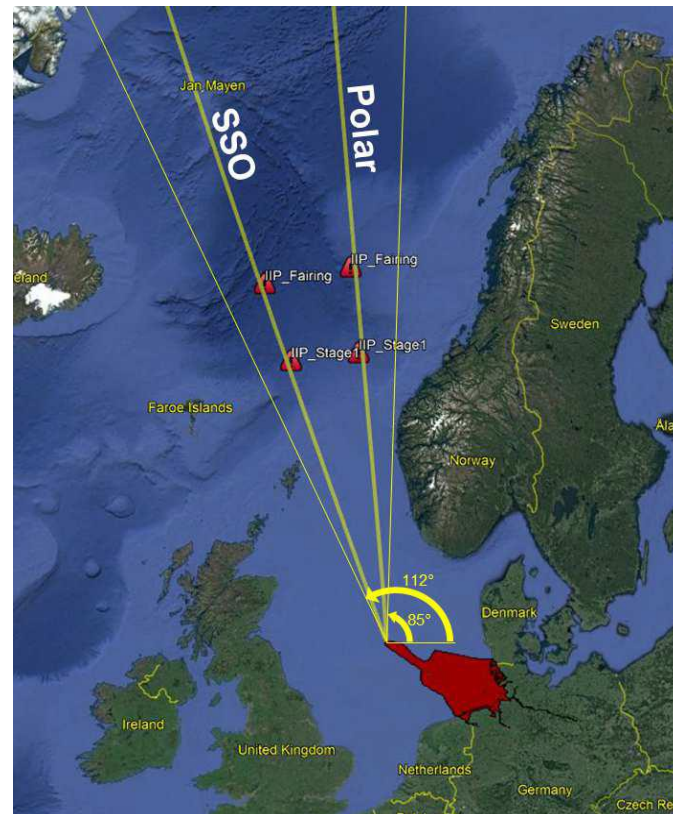
THE LAUNCH LOCATION

- Launch Site located at German exclusive economic zone;
- So called “Entenschnabel” (duckbill);
- Distance to Bremerhaven, Germany is 400 km;
- Launch Site coordinates:
 - NW point of the EEZ;
 - ~55.92°N, 3.35°E.
- Area with a size of 570 km²;
- The area EN19, close to the launch site will be used for renewable energy use in 2030+.



THE LAUNCH LOCATION

- Launch corridor ranging from 85° to 112° ;
- Free from inhabited area;
- Both Polar and sun-synchronous orbits can be achieved from the launch site;
- A dogleg manoeuvre may be necessary for Polar trajectories to comply with flight safety requirements.
- Preliminary assessment for drop zones for stages and fairing for both Polar and SSO typical trajectories and flight sequences also concluded that no show stopper was identified;
- Launch location change is in principle possible to offer launch inclinations lower than 85° .

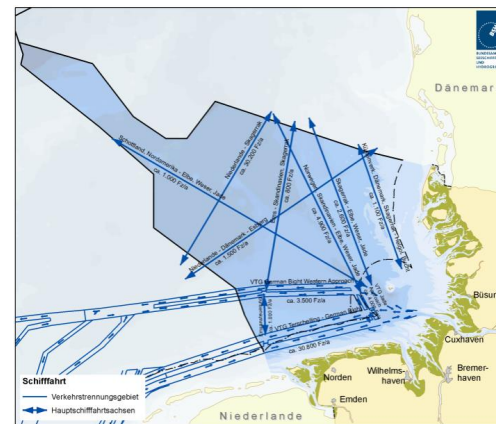
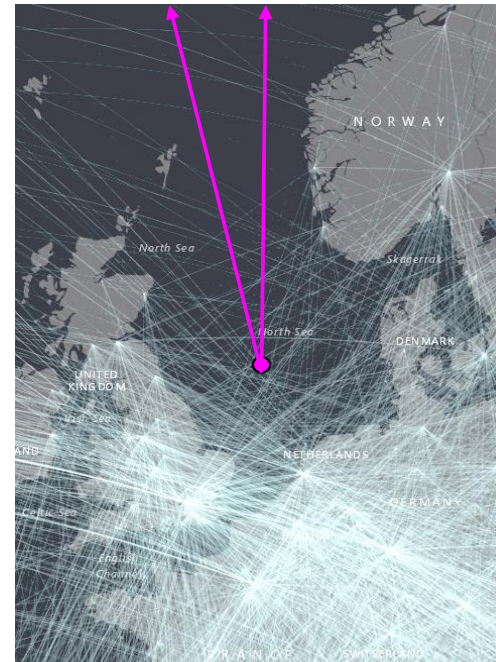


BDI, 2020



AIR AND VESSEL TRAFFIC

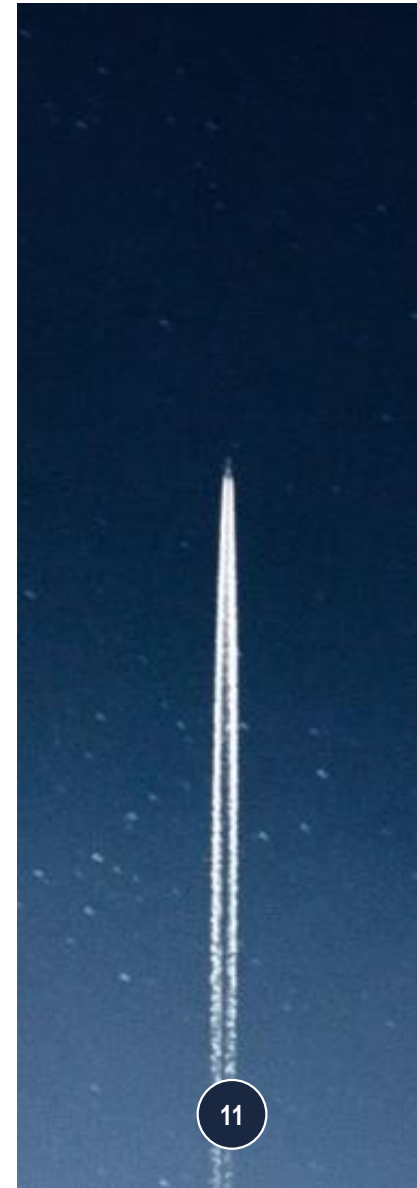
- Launch Site does not interfere with main air plane traffic routes;
- Coordination for launch approval with authorities. No disadvantages with respect to other spaceports;
- Re-entry of fairings and stages does not differ from other European spaceports;
- Launch Site and Flight Trajectory does not interfere with ship routes from Germany in the Northern Sea;
- Flight trajectory does not cross land;
- Launch Vessel is mobile;
- Safeguarding of launch site is part of the concept, assessed easier than for other launch sites.



LAUNCH VESSEL

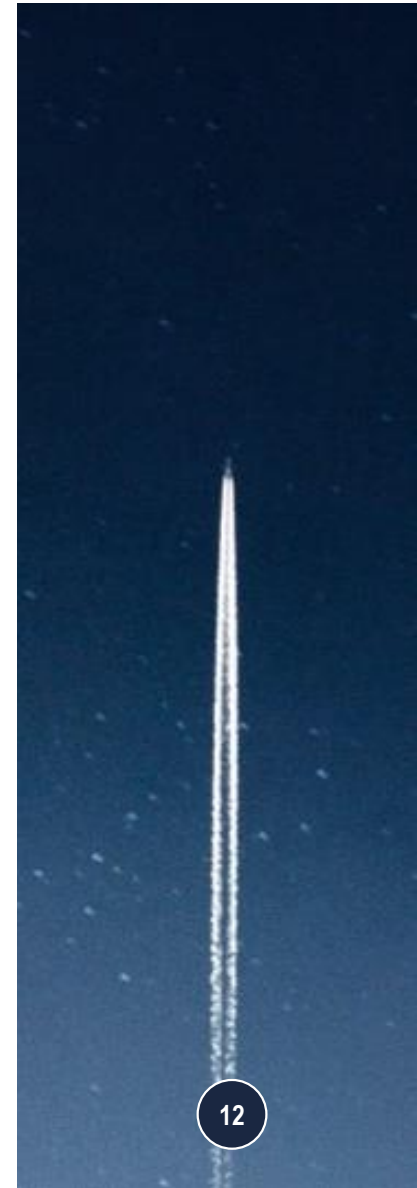
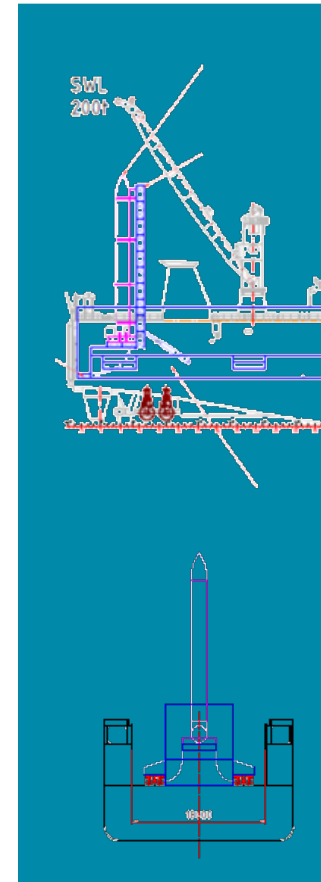
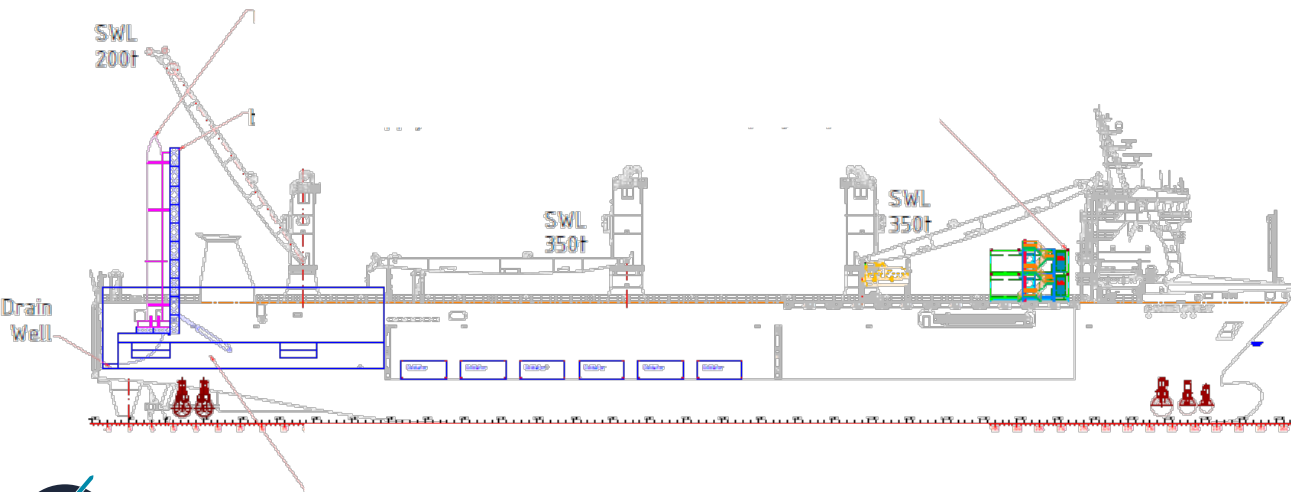
- Combi-Dock Ship;
- Stern-Ramp for Rolling Cargo;
- 3 Heavy lift cranes, combined lifting capacity of 700 tons;
- 4 ships of this series were built between 2008 and 2010 at Lloyd Shipyard in Bremerhaven and are part of the H&P fleet;
- Length: ~170 m;
- Breadth: 25 m;
- Cargo Width: 18 m;
- Depth 16 m;
- Design Draught: 5.6 m;
- Speed: 16 kn;

- Loading of heavy units of several 1000 tons over the stern ramp possible.



THE LAUNCH BOX

- Launch Box is a mobile Launch Pad;
- Individual Launch Boxes for different Launchers;
- Dimension of the foreseen Minilaunchers are possible;
- Fully mated Launcher including Payload is integrated to the launch tower in the launch box;
- Box is rolled on the ship and Launcher tested before leaving harbour;
- Launch Box is protected during transit by the side walls and the stern ramp.



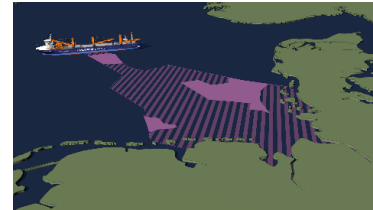
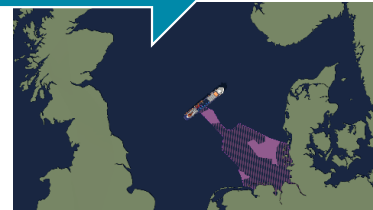
MARITIME CAMPAIGN



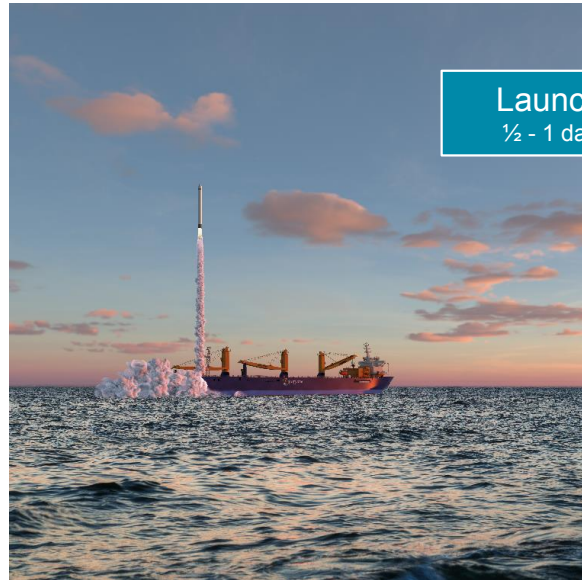
Roll-In in Bremerhaven
½ day



Transit to AWZ
1 day



Transfer to Harbour
1 day



Launch
½ - 1 day



Preparation, Erection,
Fuelling
2-7 days
(depending from Weather)



THE LAUNCH

- Launch Box is opened, Launcher erected for launch;
- Crew is evacuated to the control vessel before fuelling of the rocket;
- Fuelling process is controlled from the control vessel;
- Launch vessel is equipped the dynamic positioning system D2P to keep the launch site position;
- System ensures an angle of encounter with prevailing waves to keep pitch and roll movements as low as possible;
- Stern ramp is opened -> exhaust jet of launcher is not hindered to exit the ship after deflected by a deflector.



ADVANTAGES OF THE OFFSHORE SPACEPORT

Customers will benefit from...



Efficient Logistics

- a launch concept aimed exclusively at small launch vehicles with a land-based infrastructure for logistics and assembly;
- Bremerhaven as a base and assembly location reduces logistics costs and offers a fast-reacting supply of industrial goods (e.g. industrial gases) and services;
- Bremerhaven can be reached quickly from Hamburg and Bremen airports (no day trip within Europe);
- efficient transport and launch campaigns based on an individual, ship-independent "launch box concept";
- positive influence on the entire CO2 footprint through shorter distances for transport and increased flexibility.



Weather

- Good planning of the transit and the start procedure based on the latest weather data (weather service, offshore wind, aviation);
- Almost year-round launch campaigns and short-term planning due to lower weather restrictions.



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LAUNCHING YOUR IDEAS

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