ALINA

Autonomous Landing and Navigation Module

Mission

ALINA is the autonomous landing and navigation module capable of delivering 100 kg payload to the lunar surface. Starting point is a geostationary transfer orbit (GTO) with an apogee between 22,000 km and 65,000 km from where ALINA can manage transfer, orbit insertion and landing under her own propulsion. This initial orbit span can be covered effectively due to three different propellant tank configurations, which makes ALINA compatible with all major commercial launch solutions. Up to three ALINA modules would fit into a Falcon 9.

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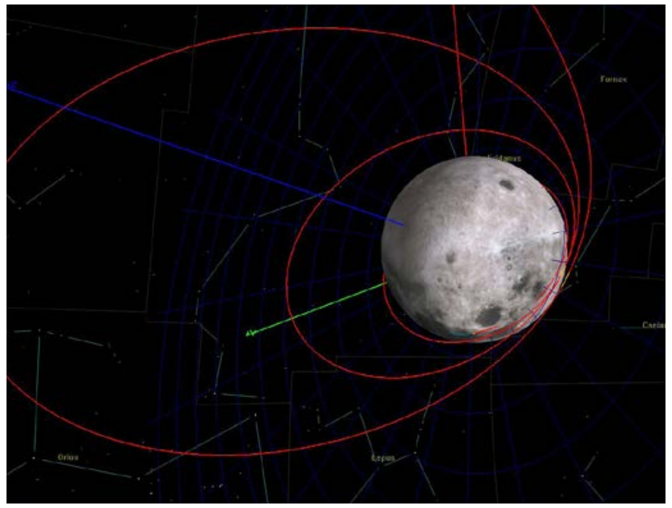
Business

Today, there is no commercial option to go beyond earth orbit. But we are going to change that. ALINA's variable tank size and the straight-to-the-point, simple propulsion concept deliver a variety of options to our customers. First, ALINA represents a turnkey autonomous landing module for all lunar regions including the poles. Furthermore, ALINA can serve as a transfer stage for medium duration missions within or even beyond lunar orbit. And finally, ALINA pre-sents an economic solution to deorbit large satellites from low earth orbit.

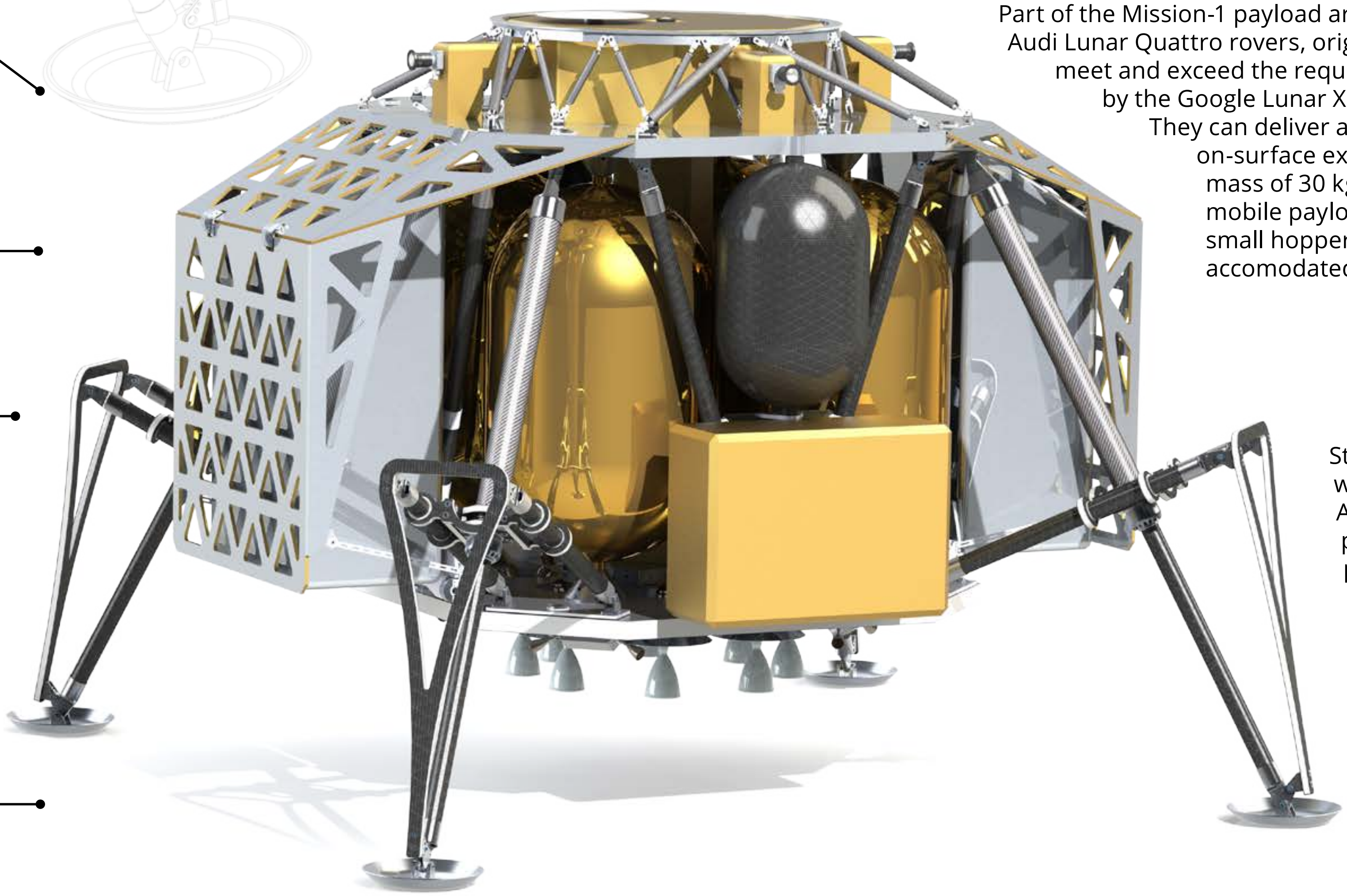
Following "Mission-1" as the first lunar mission, we are estimating a demand of up to 6 dedicated payload and technology precursor missions to the moon between 2018 and 2030. Our competitive payload pricing scheme and the open commercial architecture enable smaller entities (such as private, research, education and government) to easily conduct missions beyond earth orbit. ALINA herself is also available as a licensable IP to be incorporated into any existing mission frameworks.

Journey

A commercial launch vehicle will put our spacecraft into a highly elliptical geostationary transfer orbit. From there, a single burn at perigee – called "translunar injection" (TLI) – will send the spacecraft on a path crossing the moon's gravitational field. When the moon starts pulling her in, we'll initiate the "lunar orbit insertion" (LOI) maneuver. This will take us into an elliptic orbit around the moon, which then will be lowered through two more burns. At last, we'll reduce the orbit height for descent and initiate the well-timed landing burn – in other words: hit the brakes – to arrive at the targeted spot on the lunar surface.



Technology



ALINA's **redundant onboard computer system** is governing the spacecraft while redundant means of telemetry ensure communication.

Her **lightweight truss structure** is able to accommodate three different tank sizes.

The module herself is about 2.6 m long, 2.0 m wide, 1.8 m tall and the diagonals between two legs span 3.5 m.

Omnidirectional view through 7 cameras enables a high level of autonomy on guidance and navigation.

The **elaborate thermal concept** is able to cope with a range of very dissimilar environments.

Hazard avoidance and detection (HAD) algorithms will choose the right spot to land on.

She can be configured with or without her **foldable and cushioning landing legs.**

She is powered by **8 pulsable main thrusters** instead of gimbaling a single large engine.

Payload

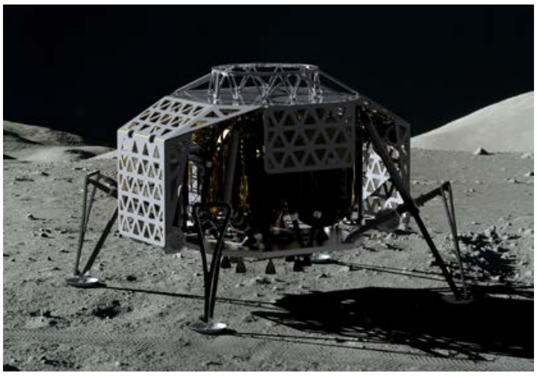
Part of the Mission-1 payload are two Audi Lunar Quattro rovers, originally designed to meet and exceed the requirements set out by the Google Lunar XPRIZE competition. They can deliver and conduct mobile on-surface experiments with a mass of 30 kg per unit. Additional mobile payloads such as rovers, small hoppers or walkers can be accomodated by ALINA as well.

Stationary payloads will benefit from ALINA's capability to provide telemetry, power, and thermal management during lunar daytime. Custom interfaces and environmental parameters are negotiable.

Currently, dispensers for 3U lunar orbit CubeSats are integrated on ALINA's secondary payload rack. Other sizes and formats can be adapted. Due to high demand, a separate follow-on mission with ALINA as an orbiter is already scheduled.

PTScientists

PTScientists is an aerospace engineering company founded in 2008 with the goal to develop low-cost space exploration and robotics solutions and to participate in the Google Lunar XPRIZE challenge. The company is headquartered in Berlin, Germany with 12 fixed employees and a team of 35 part-time contributors. Technical cooperation partners include include Audi AG, the German Aerospace Center (DLR) as well as technical universities in Germany and Austria.



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