PLDSPACE™

MIURA 1 SN1 TEST FLIGHT 1 MISSION

6TH OCTOBER, 2023

PRESS KIT

pldspace.com

MIURA 1 SN1 TEST FLIGHT 1

INDEX

SUMMMARY OF THE MISSION MIURA 1 SN1 TEST FLIGHT 1

LAUNCH SITE

Médano del Loro launch site. “El Arenosillo” Test Centre, at the National Institute of Aerospace Technology (INTA) Huelva, Spain.

LAUNCH WINDOW

07th October from 02:00 to 10:00 (CET) (00:00h to 08:00h UTC)

LAUNCH TIME T-0

07th October 02:00 (CET) (00:00h UTC)

PAYLOAD

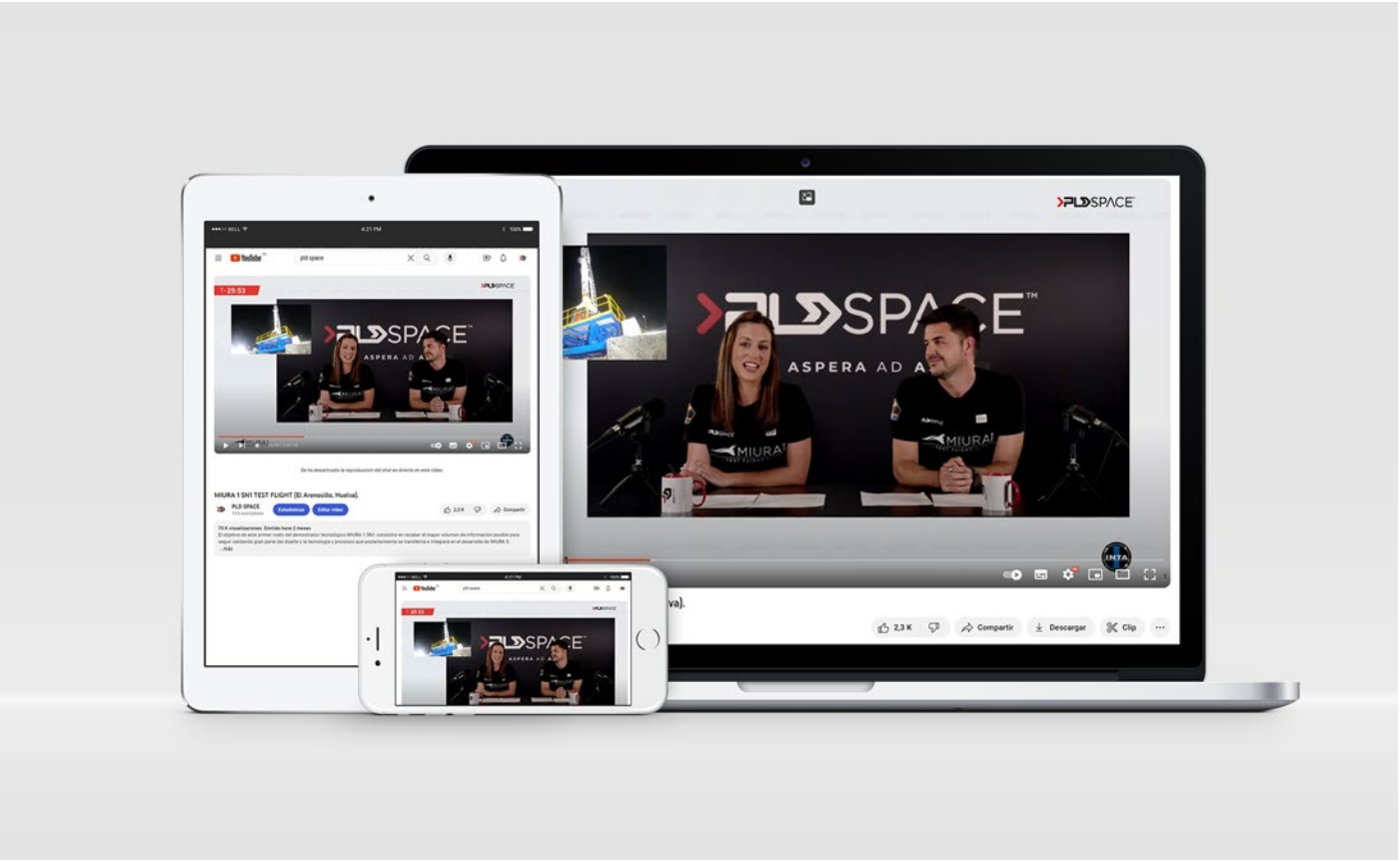
Scientific experiment of the German Center of Applied Space Technology and Microgravity (ZARM)

12 MINUTES
TOTAL FLIGHT TIME

6 MINUTES
TIME IN MICROGRAVITY

80 KM
OF APOGEE OF THESUBORBITAL FLIGHT

4 HOURS
TO RECOVER THE PAYLOAD AFTER THE FLIGHT



INFORMATION FOR THE MEDIA

LIVESTREAMING

The launching of the MIURA 1 can be seen live in:

https://www.youtube.com/@PLDSPACE/streams

The streaming will start on **7th October** at **01:00h CET** (6th October at 23:00h UTC), **approximately T-60 minutes before the launch**

FOLLOW US

STREAMING FILE

Once the mission has been completed, the streaming will be available for the public for subsequent views in:

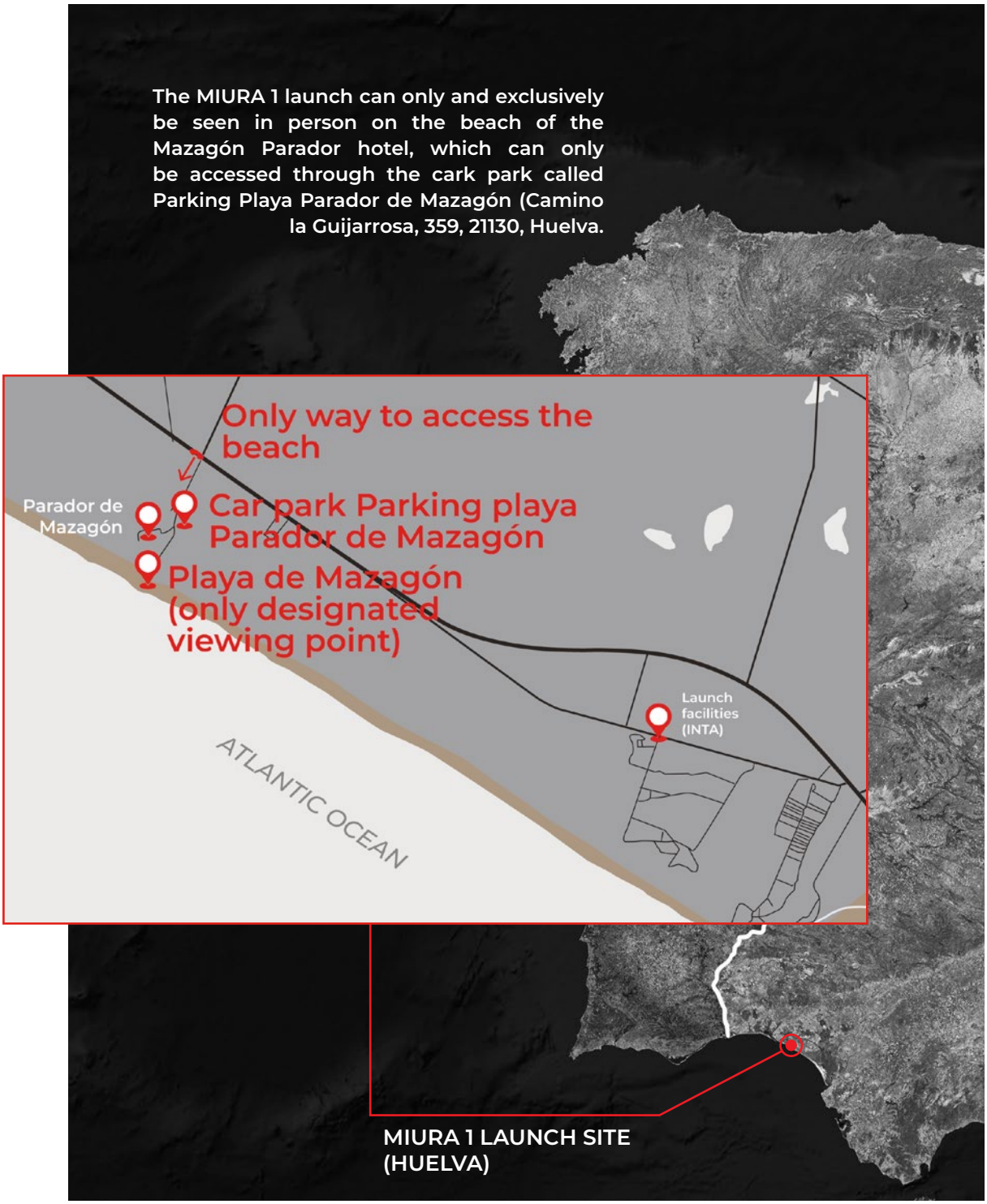
https://www.youtube.com/@PLDSPACE/streams

LAUNCH LANDING PAGE

On the completion of a successful mission, photos and audio-visual resources will be uploaded in this link:

https://pldspace.com/en/launches

VIEWING LOCATIONS TO FOLLOW THE LAUNCH



OBJECTIVES OF THE MIURA 1 SN1 TEST FLIGHT 1 MISSION

Background

In 2022 the Test Campaign with Element A (MIURA 1 qualification unit) was carried out at the Teruel facilities, which included static fire tests lasting 5 and 20 seconds and a complete mission test that lasted 110 seconds.

At the launch site, located in the “El Arenosillo” Test Centre, at the National Institute of Aerospace Technology (INTA) in Huelva, numerous unit tests and combined tests have been carried out to guarantee that the launch vehicle, the launch infrastructure and the ground segment work properly.

These tests have included unit tests on a specific subsystem or specific equipment, and combined chronology tests to validate the overall sequence such as the Wet Dress Rehearsal (WDR) of the stage or the corresponding static test.

After successfully completing all the tests, on the 17th of June the first attempt at launching it was made in which the auto sequence stage was reached by complying with the times stipulated in the chronology and with the nominal engine start-up and thrust. An automatic abort occurred just 0.2 seconds prior to lift-off. It occurred due to the release times of the umbilicals. The ground software interpreted that one of these cables had not been released and automatically sent a launch abort command, although the reality is that this release had indeed been executed, only with a delay of 0.1 seconds. Data obtained by PLD Space show that this delay was caused by a one-degree deviation in inclination measured by a strongback sensor.

THE LAUNCH OF THE FIRST PRIVATE EUROPEAN ROCKET, WHICH MEETS RECOVERY AND REUSE REQUIREMENTS THAT **HAVE ONLY BEEN ACHIVED BY THREE COMPANIES IN SPACE HISTORY.**

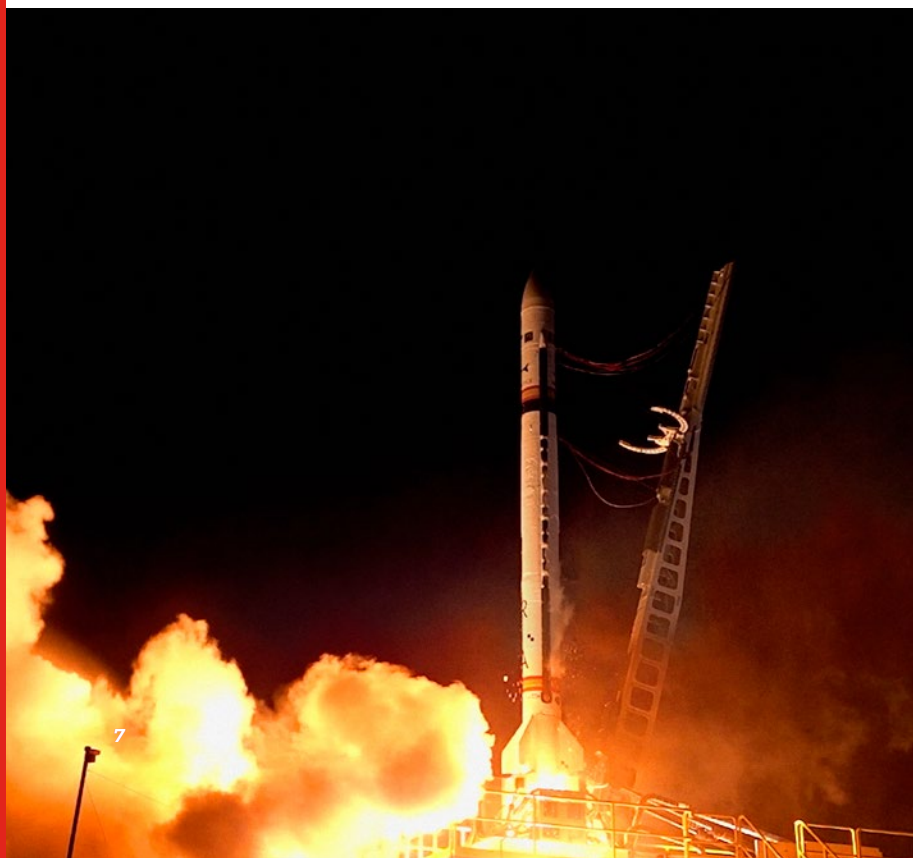


Photo: Payload of the ZARM

MISSION DETAILS: PAYLOAD

The mission is expected to last 12 minutes. The ascent phase will last the first 6 minutes of the flight, when, in microgravity and apogee conditions, the 80 km altitude will be reached. The mission will end with the recovery of the rocket in the Atlantic Ocean after splashdown.

The MIURA1 SN1 mission has an experiment from the German Center of Applied Space Technology and Microgravity (ZARM) on board, and the objective of this is to study microgravity conditions. In this way, this first suborbital flight will enable ZARM to obtain the necessary information to carry out scientific experiments on future suborbital flights.

MAIN OBJECTIVES OF THE MISSION

The objective of the first flight of the MIURA 1 SN1 technology demonstration of PLD Space is to acquire as much information as possible about the flight in order to obtain data that helps determine the validation process and the design of the technology, along with any potential improvements or changes in the development that will subsequently be made to the MIURA 5 orbital launch system. In this sense, every second that MIURA 1 is in the air will be a successful second.

This first mission will enable PLD Space to check the performance of key technologies during flight time, which is something that has not been possible before. The following will be analysed

- The engine thrust profile in flight conditions.
- The aerodynamic performance of the launch vehicle
- The follow-up of the nominal trajectory.
- The nominal performance of all the subsystems in real conditions.
- The exposure to real conditions in space.

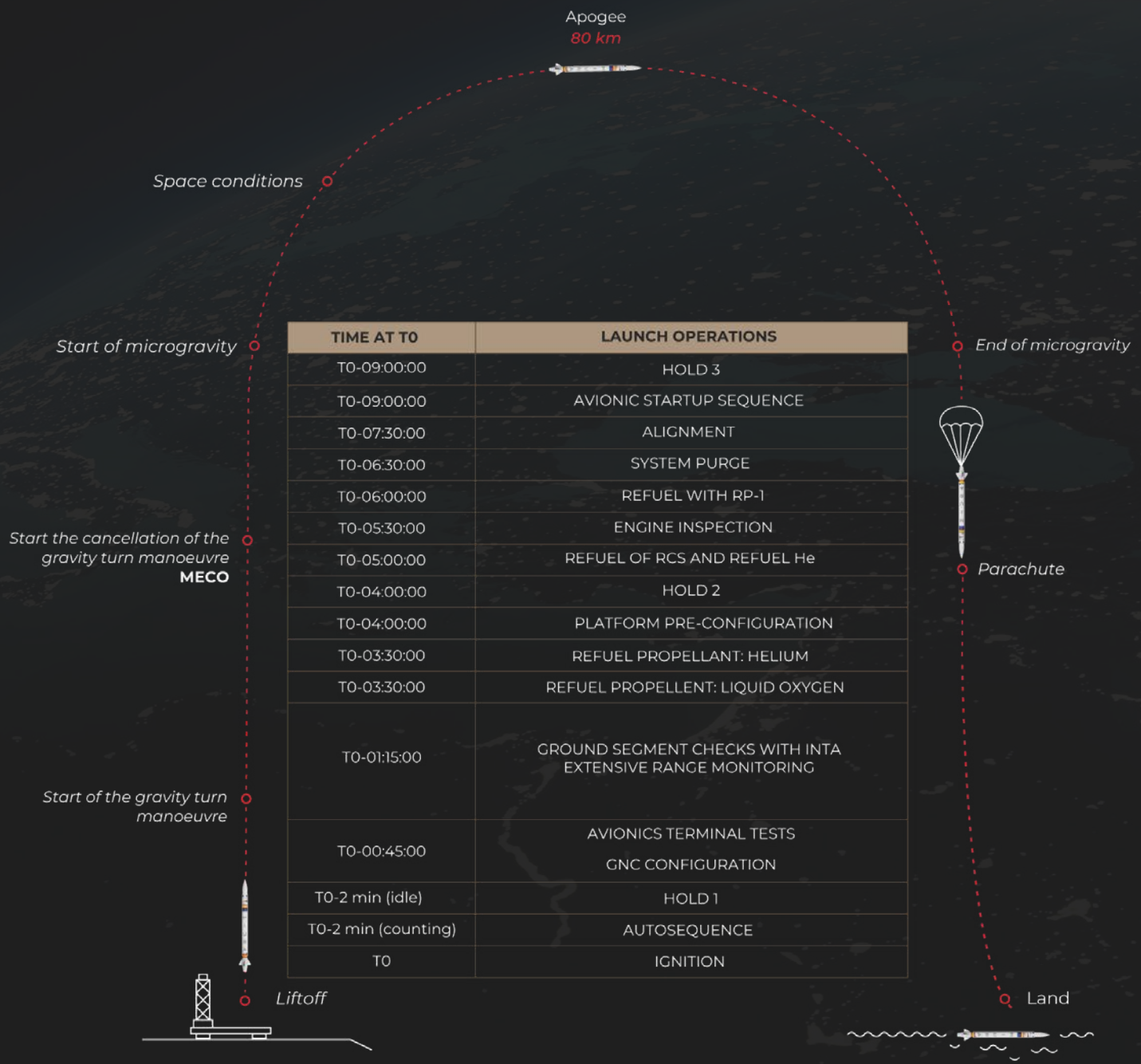
SECONDARY OBJECTIVES OF THE MISSION

The secondary objectives of the mission will focus on acquiring in flight information about different subsystems, especially in relation to the performance of MIURA 1 during the re-entry, as well as the possibility of arriving in splashdown conditions that ensure the recovery of the rocket in the Atlantic Ocean.

To meet this objective there are two boats in the designated splashdown area for an eventual recovery of MIURA 1. To this end, there are also divers that specialise in offshore underwater operations and air surveillance teams.

MAIN EVENTS OF THE LAUNCH

Below there is a temporary list of the lead-up events in the chronology of MIURA 1. Both the times and the sequencing are shown for guidance only



TIME AT T0	LAUNCH OPERATIONS
T0-09:00:00	HOLD 3
T0-09:00:00	AVIONIC STARTUP SEQUENCE
T0-07:30:00	ALIGNMENT
T0-06:30:00	SYSTEM PURGE
T0-06:00:00	REFUEL WITH RP-1
T0-05:30:00	ENGINE INSPECTION
T0-05:00:00	REFUEL OF RCS AND REFUEL He
T0-04:00:00	HOLD 2
T0-04:00:00	PLATFORM PRE-CONFIGURATION
T0-03:30:00	REFUEL PROPELLANT: HELIUM
T0-03:30:00	REFUEL PROPELLENT: LIQUID OXYGEN
T0-01:15:00	GROUND SEGMENT CHECKS WITH INTA EXTENSIVE RANGE MONITORING
T0-00:45:00	AVIONICS TERMINAL TESTS GNC CONFIGURATION
T0-2 min (idle)	HOLD 1
T0-2 min (counting)	AUTOSEQUENCE
T0	IGNITION

LAUNCH VEHICLE MIURA 1

PAYLOAD BAY

» Designed to research microgravity and technological development.

» Nominal payload mass of 100 kg/200 lb.

» 4 single payload compartments.

- **SINGLE COMPARTMENT**

» The single compartment with mass and volume limitation for the payloads, has an energy supply, data storage and downlink services

FUEL TANKS

» Cryogenic liquid oxygen tank (LOX): 1100 l/-182°C

» Kerosene tank (KER): 600 l

PROPULSION SYSTEM

» TEPREL-B. Liquid fuel rocket engine developed by PLD Space.

» In 2021 it became the first KeroLOX rocket engine developed in Europe for space flights

» 110 seconds of burn time.

» Less than 5 Gs of acceleration during the ascent.

AVIONICS

» Telemetry system

» Energy storage and distribution

» Computer for payload

» Conditioning and acquisition sensor

» Main TVC and RCS engines

TECHNICAL SPECIFICATIONS OF THE **MIURA 1**

- **Length:** 12.5 m
- **Diameter:** 0.7 m Ø
- **Stages:** 1
- **Type of structure:** Monohull, aluminium 2014
- **Material:** Aluminium 2014 series
- **Mass at liftoff:** 2620 kg
- **Number of engines:** 1 TEPREL-B
- **Cycle type engine:** Pressure fed
- **Trust at liftoff:** 30.0 kN
- **Propellant:** Kerosene and liquid Oxygen
- **Pressurization system:** Bang-Bang, with Helium
- **Attitude control:** Yes, using TVC on the main engine.
- **Turn control:** Yes, using RCS through cold gas.

MIURA 1 LAUNCH RISK ANALYSIS

POSSIBLE CAUSES DURING PRE-LAUNCH (GROUND OPERATIONS)		
SITUATION	**EXPLANATION**	**AND THEN WHAT?**
Changes in the weather forecast, especially upper level winds (km8-km 12).	PLD Space monitors the direction, magnitude and gusts of wind at altitude by atmospheric sounding with balloon probes days before launch. However, as we have already seen, these winds at altitude have an important effect on the timeline. In the event that these winds exceed the safety limits established, or that the effect of these winds, in the event of an anomaly of the launcher in flight, would have effects on the safety zone.	Weather changes will be evaluated until the last moment to assess whether or not to move forward.
Problems associated with propellant loading, particularly the LOX lines, due to freezing of valves.	If during the liquid oxygen filling phase, an anomaly of the ground valves is detected, the problem will be analyzed in real time to determine if it is solvable or not at that moment. If the problem cannot be solved, the launch will be postponed for that day.	The information will be analyzed to determine the causes and propose mitigating and/or corrective actions.
Violation of the security range on land or in the maritime zone.	In the event of entry of an unauthorized vessel or person into the land or maritime zones, this would be detected by the tracking equipment and the established procedure for its interception would be activated. If compatible with the times, the launch would continue.	The affected area will be evacuated with the support of state security forces and corps.
On-board sensor reading anomaly.	If during the pre-launch phase of MIURA 1, a sensor on board the rocket shows an anomalous reading, it will be determined if this is due to a sensor problem or due to the process itself. After evaluation, it will be determined whether or not to continue with the launch.	The information will be analyzed to determine the causes and propose mitigating and/or corrective actions.
Erratic behavior of stage valves	If during the pre-launch phase of MIURA 1 any previously unobserved behavior of the rocket's on-board valves is detected, it will be determined if this behavior is due to a mechanical or electrical problem, or if it is associated with another cause. After evaluation, it will be determined whether or not to continue with the launch.	The information will be analyzed to determine the causes and propose mitigating and/or corrective actions.

MIURA 1 LAUNCH RISK ANALYSIS

POSSIBLE CAUSES DURING AUTO SEQUENCE		
SITUATION	**EXPLANATION**	**AND THEN WHAT?**
On-board sensor reading anomaly.	On-board sensor reading anomaly.	The information will be analyzed to determine the causes and propose mitigating and/or corrective actions.
Erratic behavior of any stage valve	Auto sequence aborts the launch	The information will be analyzed to determine the causes and propose mitigating and/or corrective actions.
The stage is not properly pressurized	Auto sequence aborts the launch	The information will be analyzed to determine the causes and propose mitigating and/or corrective actions.
Automatic transitions and interactions between the launchpad and the rocket do not occur.	Auto sequence aborts the launch	The information will be analyzed to determine the causes and propose mitigating and/or corrective actions.
Rocket autonomously aborts launch by sequencing	Auto sequence aborts the launch	The information will be analyzed to determine the causes and propose mitigating and/or corrective actions.

POSSIBLE CAUSES DURING FLIGHT		
SITUATION	**EXPLANATION**	**AND THEN WHAT?**
Trajectory degradation	If it is detected that the trajectory being followed by the launcher is not as planned, the ground team will determine if it complies with the parameters established for the trajectory and the safety corridor. In this scenario, the "flight termination" activities will be activated to neutralize the launcher.	The information will be analyzed to determine the causes and propose mitigating and/or corrective actions.
Degradation of engine performance	An early degradation of propulsion will have an influence on the trajectory. The necessary safety criteria have been established so that, in the event that this scenario is detected, the "flight termination" activities will be activated to neutralize the launcher.	The information will be analyzed to determine the causes and propose mitigating and/or corrective actions.
CNG performance degradation	An early degradation of CNG will have an influence on the trajectory. In addition, the necessary safety criteria have been established so that, in case this cescenario is determined, the "flight termination" activities will be activated to neutralize the launcher.	The information will be analyzed to determine the causes and propose mitigating and/or corrective actions.
Avionics performance degradation	An early degradation of the avionics will have an influence on the loss of onboard telemetry signals. If this happens, and especially if there is an effect on the trajectory, the "flight termination" activities will be activated to neutralize the launcher.	The information will be analyzed to determine the causes and propose mitigating and/or corrective actions.
Other possible scenarios	For all other possible anomalies that could lead to a degradation of the mission, a "termination of flight" criterion has been established to neutralize the launcher in the event that they occur.	The information will be analyzed to determine the causes and propose mitigating and/or corrective actions.

ABOUT
PLD SPACE

PLD Space is a Spanish company that designs, develops, manufactures and operates reusable launch vehicles to send small satellites into space. The company was set up in 2011 by Raúl Torres and Raúl Verdú to increase the European capacity to go into space and therefore speed up the innovation in numerous sectors on Earth such as the telecommunications and energy sectors, among others.

In its 12 year track record, PLD Space has been supported by the main stakeholders in the aerospace industry, such as the European Space Agency, the European Union and the Spanish Government; it has signed 6 agreements with space agencies. It now employs more than 150 professionals and it has obtained 65 million euros of investment so far, which has been invested in the design and the development of its launch vehicles: the suborbital MIURA 1 and the orbital MIURA 5.

With the launch of the MIURA 1, PLD Space becomes the company that launches the first private European rocket, which has been designed from scratch and it complies with recovery and reuse requirements that have only been satisfied by three other companies in space history.

12 years making history

2011

PLD Space is set up by **Raúl Torres and Raúl Verdú.**

2012

Initial backing from the **CDTI:** through a NEOTEC project valued at **250,000 euros.**

2013

First **round of investment:** A group of more than 20 private investors invest 1.1 million euros.

2014

First **design of the engine**.

Start of the construction **work in Teruel.**

2015

Start-up of the **testbed** in Teruel.

First rocket engine of liquid fuel in Spain.

SMILE project: awarded by the German Space Agency (DLR).

2016

LPSR1 Project: first contract with the **ESA** (Recovery System).

2017

SME Stage 1. Second Horizonte programme 2020.

Second contract with the ESA.

SME Stage 2. The European Commission gives PLD Space **€2M** to promote the development of **MIURA 1.**

2018

Inauguration of the new **HQ Elche** built on 2600 m2.

Series A round of investment of **€15.2M from investors as Aciturri"**

2019

FLPP-LPSR (ESA): PLD Space successfully carries out the drop test of the technology demonstration of the first stage of MIURA 5. With the support of **CDTI,**

INTA and the Army.

Draft agreement with **CNES to launch MIURA 5 from Kourou.**

2020

Successful completion of a **complete rocket engine test** for the MIURA 1 mission (120 seconds).

Successful test on the **high pressure tank of MIURA 1.**

First business agreement with a big operator, **Hispasat.**

2021

PLD Space signs a contract with the **ESA, for €1M, t**o study the reuse of the MIURA 5 booster.

TEPREL-B: first liquid fuel rocket engine developed in Europe for space flights.

Complete integration and public presentation of MIURA 1 at the National Science Museum of Madrid.

Series B round of financing of **€24.5M. Total investment: €40.8M.**

More than **70 professionals** in the PLD Space team.

2022

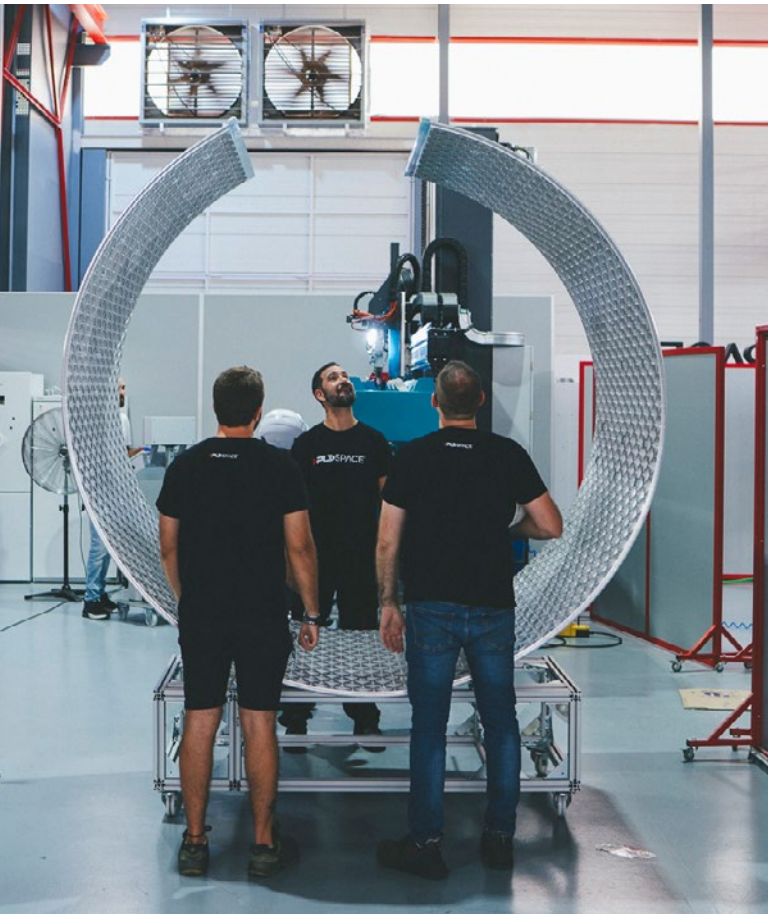
Static test of MIURA 1 of 120 seconds in the testbed in Teruel.

Series C round of funding of €24.2M. Total investment: €65M.

PLD Space team is now made up of more than 120 professionals.

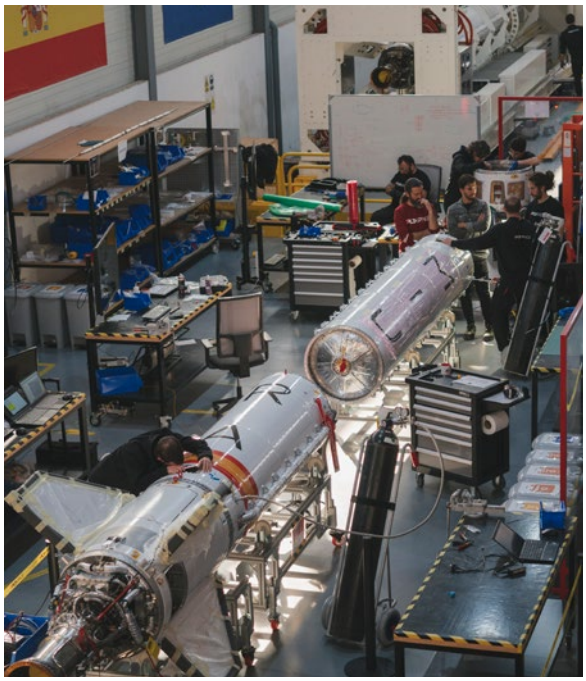
2023

PLD Space launches Europe's first private space rocket



HIGH INDUSTRIAL CAPACITY ‘MADE IN SPAIN’

PLD Space, whose headquarters is located in Elche (Alicante), employs more than 150 professionals distributed among the three work centres located in Elche, Teruel and Huelva, which consist in more than 150,000 m2 of industrial facilities.



PLD Space Headquarters (Elche)

PLD Space has an industrial unit that is more than 2600 m2 in size in Elche, where the offices and the microlauncher production and integration centre are located, along with a warehouse and a receiving area for goods. It is a small centre for the flexible manufacturing of prototypes, where each area can be customised according to the integration tasks that have to be carried out. In the last year an X-ray bunker and a heat treatment equipment have been added on to the different manufacturing areas that already existed such as welding, machining and forming.

PLD Space has a number of facilities to carry out all the R+D processes to guarantee quality, flexibility and the compliance of the deadlines set for the project. These are: metrology, where the measurements of all the pieces are checked and the quality of the product is guaranteed; electronics, to receive, test and integrate electrical equipment, parts and systems; mechanical for mechanical tests and treatment, such as stress testing or non-destructive testing; and heat treatment testing.

TEST FACILITIES (Teruel)

PLD Space has more than 150,000 m2 of facilities in Teruel Airport, where the testbeds of the company are located. These facilities are unique in Europe, which makes the test campaigns flexible, it also cuts down on the development times and it optimizes costs; which is a competitive advantage vis-à-vis other companies from the sector.

PLD Space has the first liquid fuel engine testbed in Europe, where in 2021 the first KeroLOX engine (which runs off kerosene and liquid oxygen) was certified for flights. There is a testbed for the MIURA 5 (TEPREL-C and TEPREL-C vacuum) engine combustion chambers and the gas generator turbopumps that power them. There is also a multipurpose stone slab that is used to test the structures of the launch vehicles; a vertical propulsion stage testbed; where the MIURA 1 was certified for flights; a fully bunkerized control centre from where the whole activity is managed and monitored; and a number of basic facilities such as the water pump area, a power distribution booth, an area for the uninterruptible power supply, another for the fire protection system and a hangar, which is used as a warehouse and a service point.

In 2023, the company carried out some extension work on the facilities, which consisted in the construction of various testbeds to test the first stage engines of MIURA 5, the remodelling of the existing testbed to test the entire engine of the second stage; and the construction of a hangar big enough to accommodate, at least, two totally integrated MIURA 5 orbital rocket units. The company expects to complete the work at the end of the year to start the qualification campaign of MIURA 5 at the beginning of 2024.

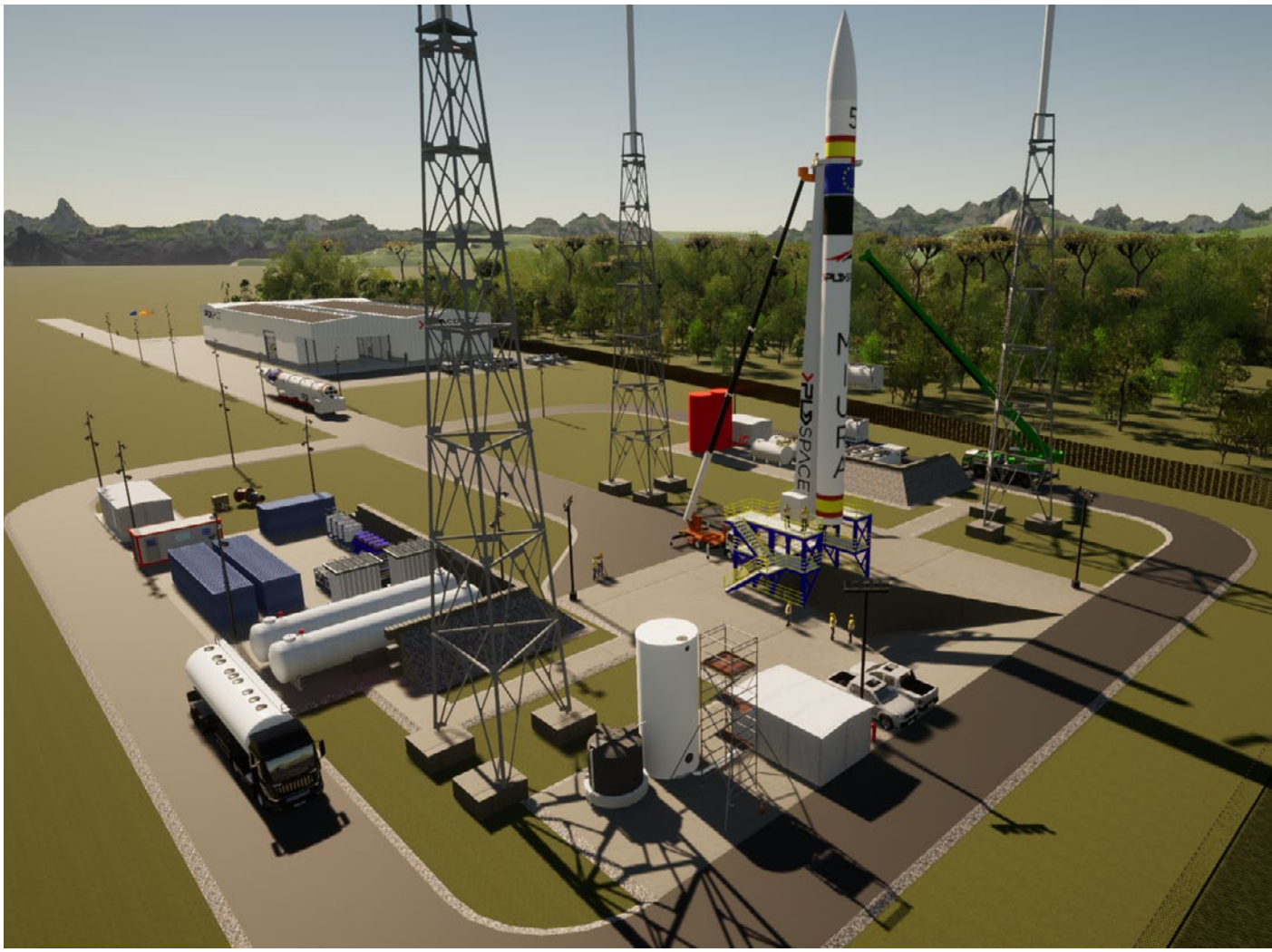
Launch site
MIURA 1 (Huelva)

PLD Space has a launch site that is more than 4500 m2 in size that is located in El Arenosillo Test Centre (CEDEA) facilities, in Huelva, which belongs to the National Institute of Aerospace Technology (INTA).

It is the only site in Spain that has the necessary equipment and permits to launch rockets into space, and carry out the tests required for the qualification of the parts of the microlauncher. To this end, PLD Space has a hangar to carry out the operations with the launch vehicle, an office area to control the mission, a flight streaming booth, and an area to welcome PLD Space customers who are going to fly in each launch campaign.

The launches take place at the Médano del Loro facilities, just four kilometres from the launch site. PLD Space has a launch pad and specific gas evacuation areas along with positioned launch pad auxiliary equipment, such as tanks, power supply, electrical and fluid lines or lights.

LAUNCH SITE
CSG, Kourou, French Guiana



PLD Space is building its launch site for orbital flights with the MIURA 5 launch vehicle in ELM-Diamant, at the Guiana Space Centre (CSG) located in Kourou (French Guiana), after having been chosen by the French Space Agency (CNES) to operate MIURA 5 from the historic space port in 2025.

PLD Space will have 3900 square metres of land to use that is divided into the launch site and a preparation area, which will include the integration hangar, a cleanroom, the control centre and the business department and offices. The company has already started work on the launch site to develop its own launch pad.

Therefore, the Kourou space port in French Guiana will be the centre that will host the launch of the MIURA 5 orbital rocket. This location is ideal for rocket launches because the Earth rotates faster in the equatorial region, which can be taken advantage of.

MANAGEMENT TEAM

Ezequiel Sánchez

Ezequiel Sánchez is the Executive President of PLD Space and he is charge of defining and implementing the growth strategy of the company, as well as manage the relationships with key stakeholders.

Raúl Torres

Raúl Torres is the Co-founder, as CEO and Launch Vehicle Chief Designer of PLD Space, he leads the launch operations and the technological development of the launch vehicles of the company, and he also draws up the future product development strategy.

Raúl Verdú

Raúl Verdú is the CBDO and the Co-founder of PLD Space and he is in charge of the business development strategy and industrial R+D, which includes devising it, the design, the legal issues and the subsequent implementation; along with the strategy to attract public and private investment.

pldspace.com

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