



Successful **MIURA 1** Maiden Launch and **NEXT !**

December 14, 2023
International 'Low Earth Orbit' Cube and Small Satellite
conference and seminar
Ankara, TURKEY

Pablo Gallego Sanmiguel
PLD Space
Senior Vice President,
Sales & Customer

**UNTIL YOU
FLY, YOU LIE**

FLYSPACE™





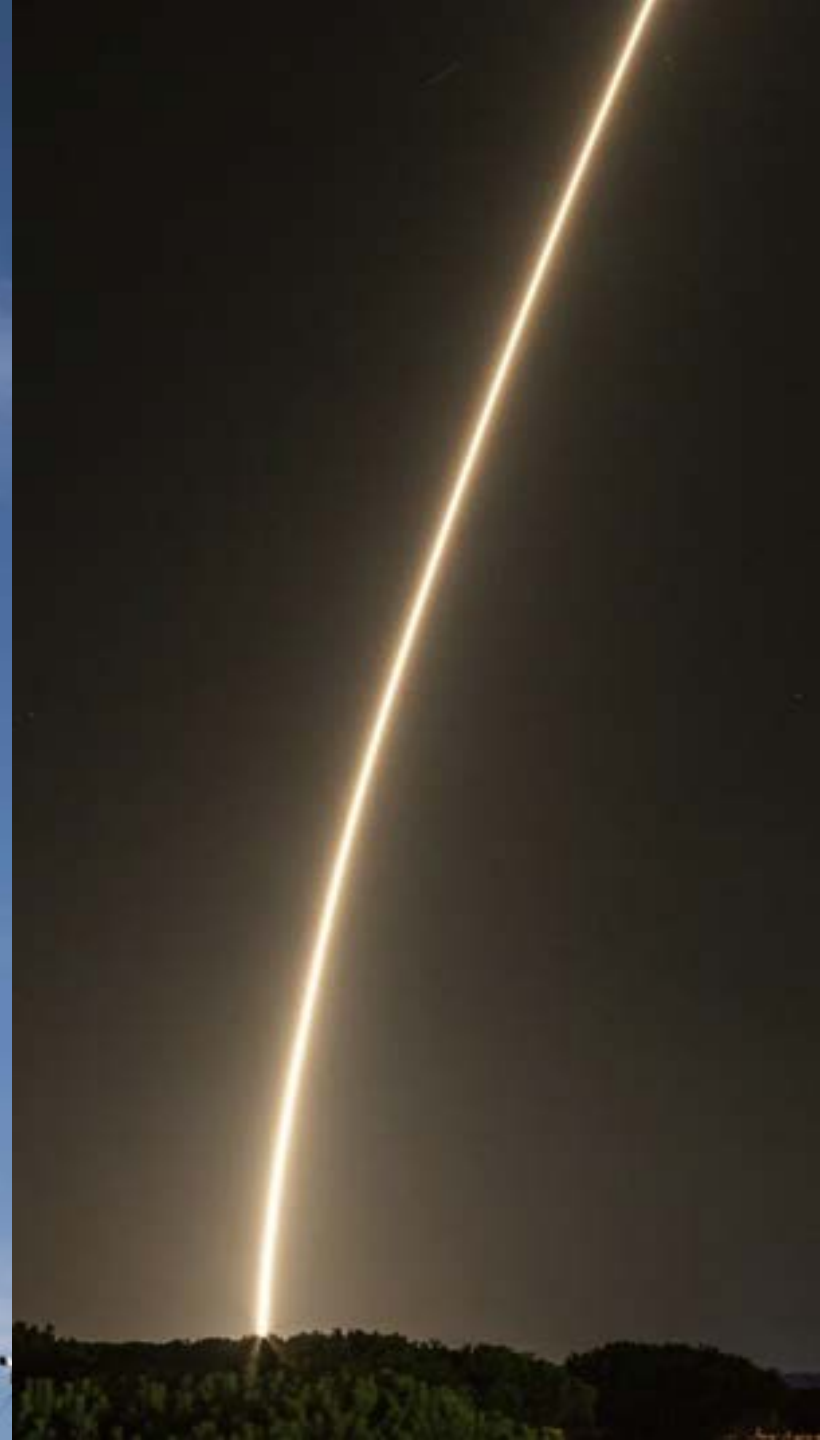
MIURA

[LINK YOUTUBE COUNTDOWN AND LAUNCH OF MIURA 1 SN1](#)

WE LAUNCH ROCKETS

On 7th October 2023, we made history by launching Europe's first ever private rocket, MIURA 1





“LA SUMA DE TODOS”

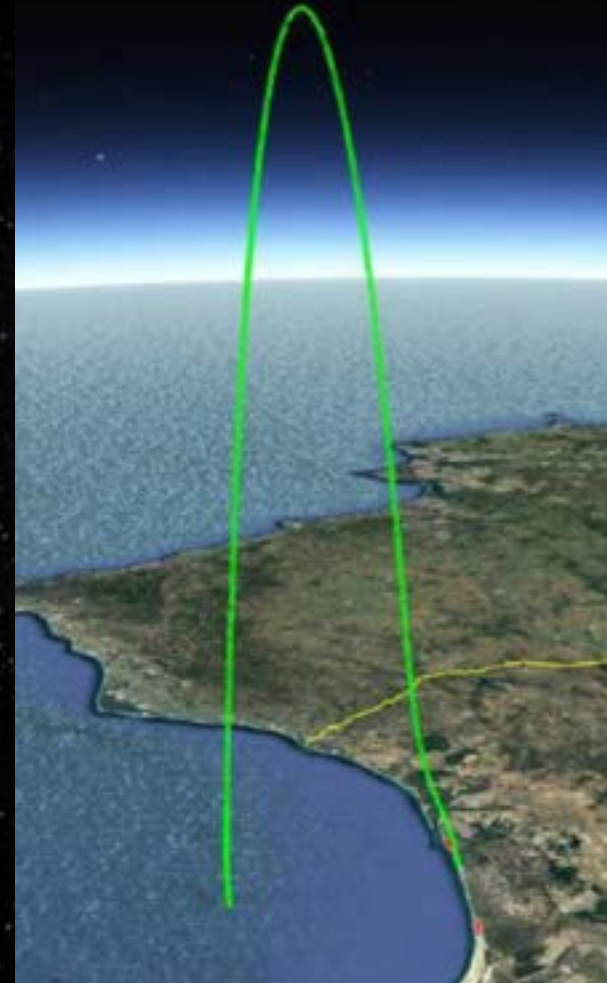
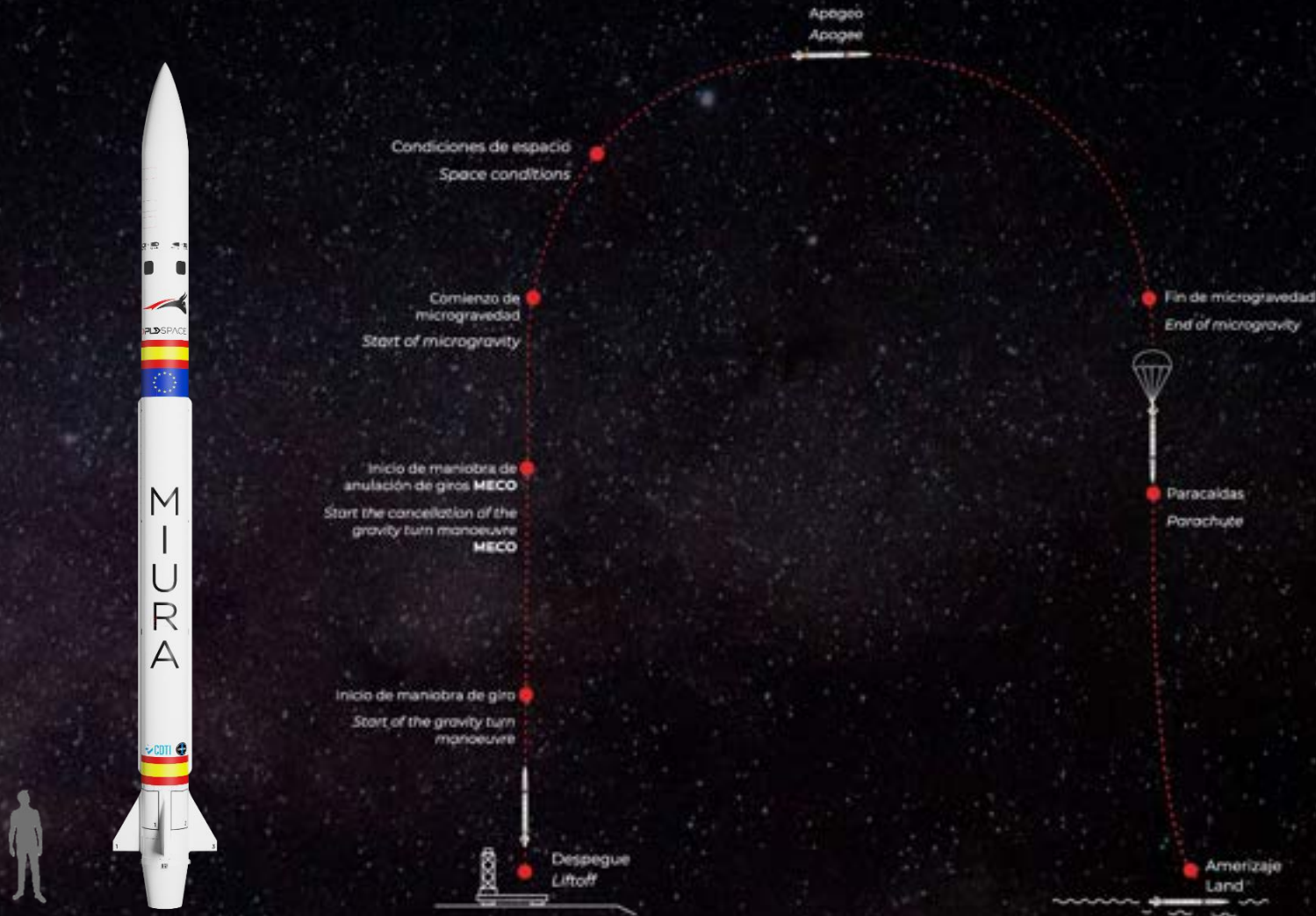
The sum of all made the successful launch possible

- All launch operations were carried out as planned and without any issues.
- All individuals involved carried out their activities on schedule.
- The last launch attempt involved more than 70 people, although 22 people were directly involved in the launch operation.



MIURA 1. OUR DEMONSTRATION VEHICLE. KEY FACTS.

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[LINK YOUTUBE ZARM VISIT TO THE MIURA 1 LAUNCH BASE](#)

[LINK YOUTUBE ZARM VISIT TO THE MIURA 1 LAUNCH BASE](#)

A SERIES OF MANY FIRSTS



- The first private company in Europe to successfully launch a rocket.
- The first private company in Europe to develop and launch a KeroLOX engine.
- The first space launch from continental Europe.
- The first space launch by European space technology start-ups.
- One of the largest "pressure-fed" rockets in the world launched.
- The first Spanish company to achieve an objective that positions the country with a new capability.




NOMINAL PERFORMANCE OF ALL SUBSYSTEMS AND SUCCESSFUL EXECUTION OF ALL OPERATIONS:

- PLD Space acquires comprehensive technological knowledge in the development of space launchers.
- This enables the company to have technical expertise in the behavior of subsystems during flight.
- It is currently the only private company in Europe with launch capability.

"APOGEO, APOGEO, APOGEO"

- We reached apogee with the correct vehicle attitude.
- We achieved microgravity conditions and ejected all individual photos of the team and their families, along with two Spanish flag patches and two business cards from Raúl Torres before meeting Raúl Verdú and founding PLD Space.
- Additionally, data was collected by the ZARM experiment.





"APOGEO, APOGEO, APOGEO"

- Following the tradition on inaugural flights, we included a cheese in the cargo bay

WE
ARE
SOLID.

DG
SPANISH SPACE
AGENCY

DG
EUROPEAN
SPACE AGENCY

PRESIDENT
PLD SPACE



MIURA

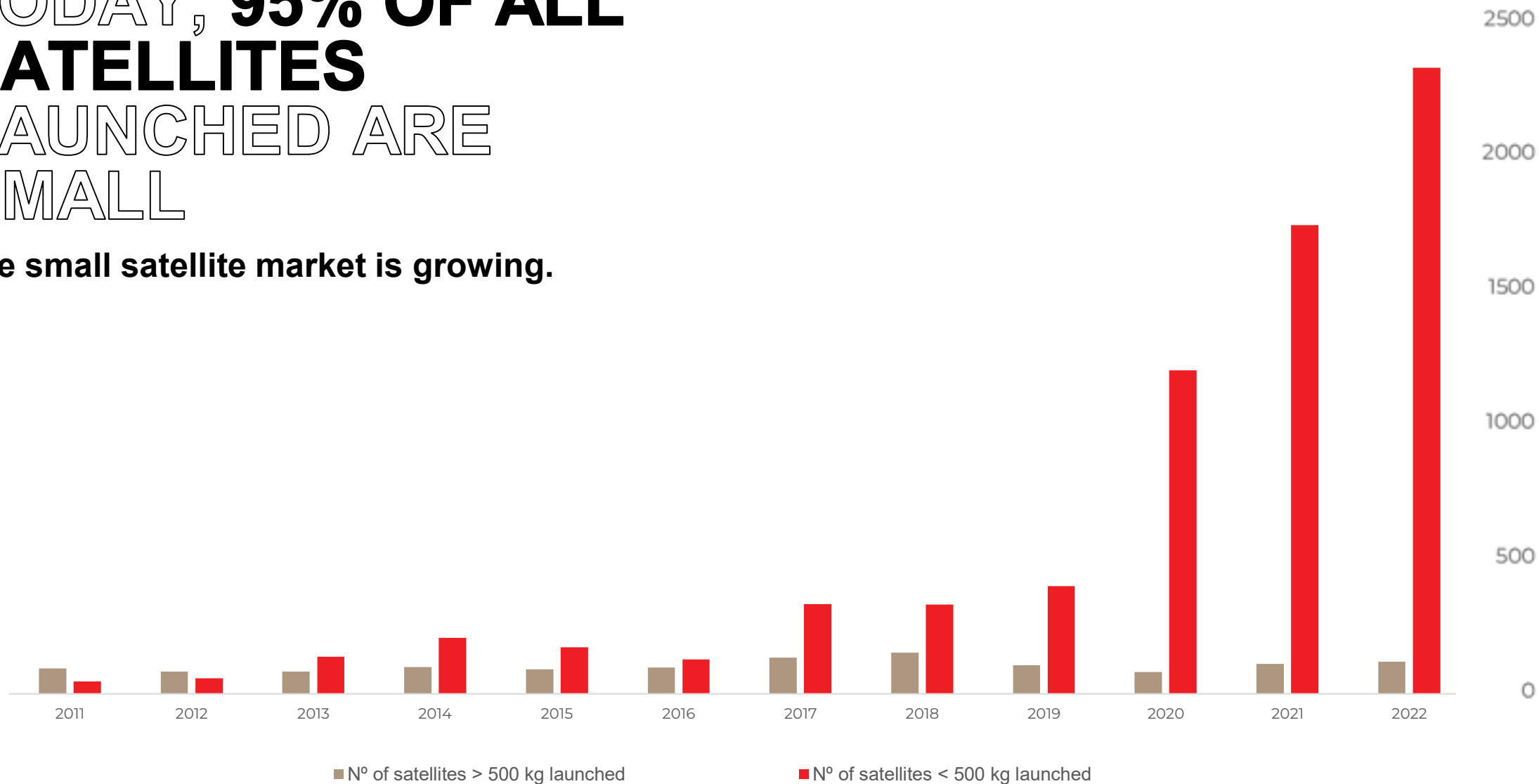
MAKING SPACE ACCESSIBLE TO ALL

FLDSPACE™



TODAY, 95% OF ALL SATELLITES LAUNCHED ARE SMALL

The small satellite market is growing.



WE OFFER RELIABLE, ON-DEMAND
LAUNCH SERVICES THAT **PRIORITISE**
THE NEEDS OF SMALL SATELLITE
OPERATORS



MEET **MIURA 5**: THE NEW EUROPEAN
WORKHORSE



LAUNCHING SATELLITES
INTO SPACE TO SOLVE
PROBLEMS ON

EARTH



[LINK YOUTUBE MIURA 5 LAUNCH ANIMATION](#)

MORE THAN 150
VISIONARIES
**WORKING TO
DELIVER YOU
TO ORBIT**



MIURA LAUNCH VEHICLE FAMILY.

12 meters



MIURA 1

Demonstration vehicle

32 meters



MIURA 5

550 kg to SSO orbit



TEPREL-C ENGINE

190 kN Sea level - 50 kN Vacuum

MIURA 5: A SIMPLE, ROBUST ROCKET



The New European Workhorse

PROPELLANTS

Kerosene + Liquid oxygen

Cheap and easy to handle propellants

FIRST STAGE ENGINES

5X TEPREL-C (190 KN-SL EACH)

Based on Miura 1 & easily integrated

SECOND STAGE ENGINES

1X TEPREL-C_VAC (50KN-VAC)

Based on Miura 1 & easily integrated

DIAMETER / HEIGHT

2 M / 34 M

Optimised for desired payload performance

TURBOMACHINERY

Fuelled by single turbopump

Avoids heavy stainless steel structural requirement for high pressures

STRUCTURES

Aluminium Alloy

Light-weight material traditionally used in aerospace industry

AVIONICS & CNG

New generation

Advanced avionics & guidance, navigation & control systems

PAYLOAD FAIRING & ADAPTER CONE

Commercial fairing + kick stage optional

Optimised payload capacity with enhanced orbital accuracy

RECOVERY STRATEGY

Parachute and recovery from the sea

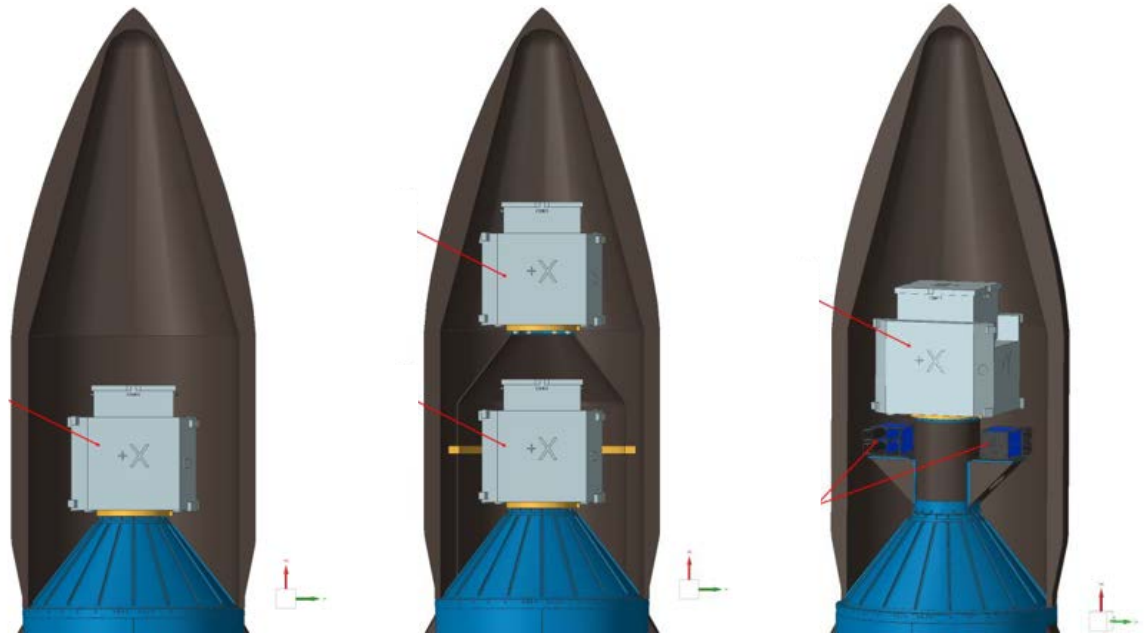
Reusability reduces cost

NOMINAL PAYLOAD

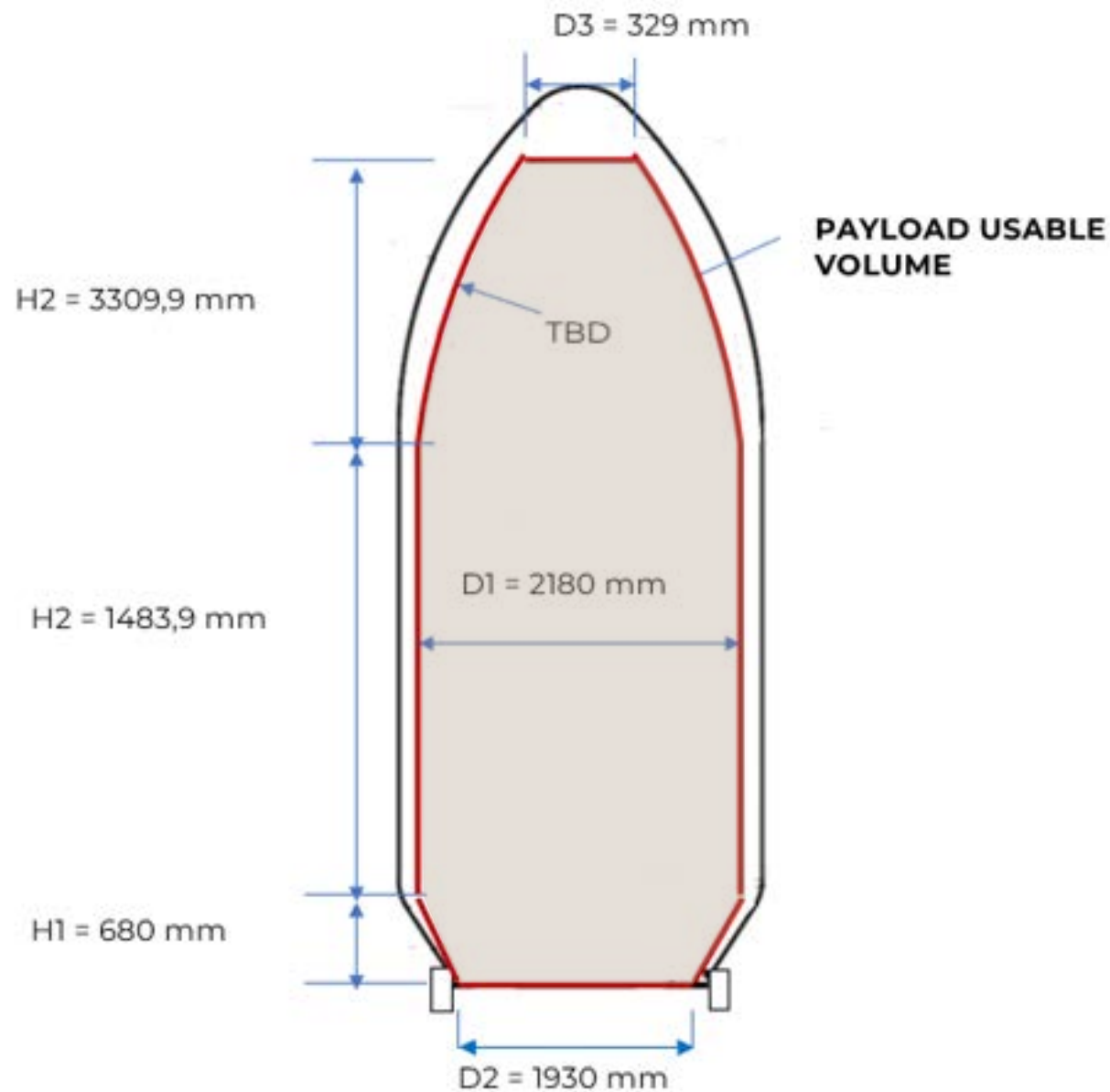
450 kg at 500 km SSO

Max payload: 1100 kg @ equatorial orbit

DEDICATED OR
MULTI-PAYLOAD
AVAILABLE

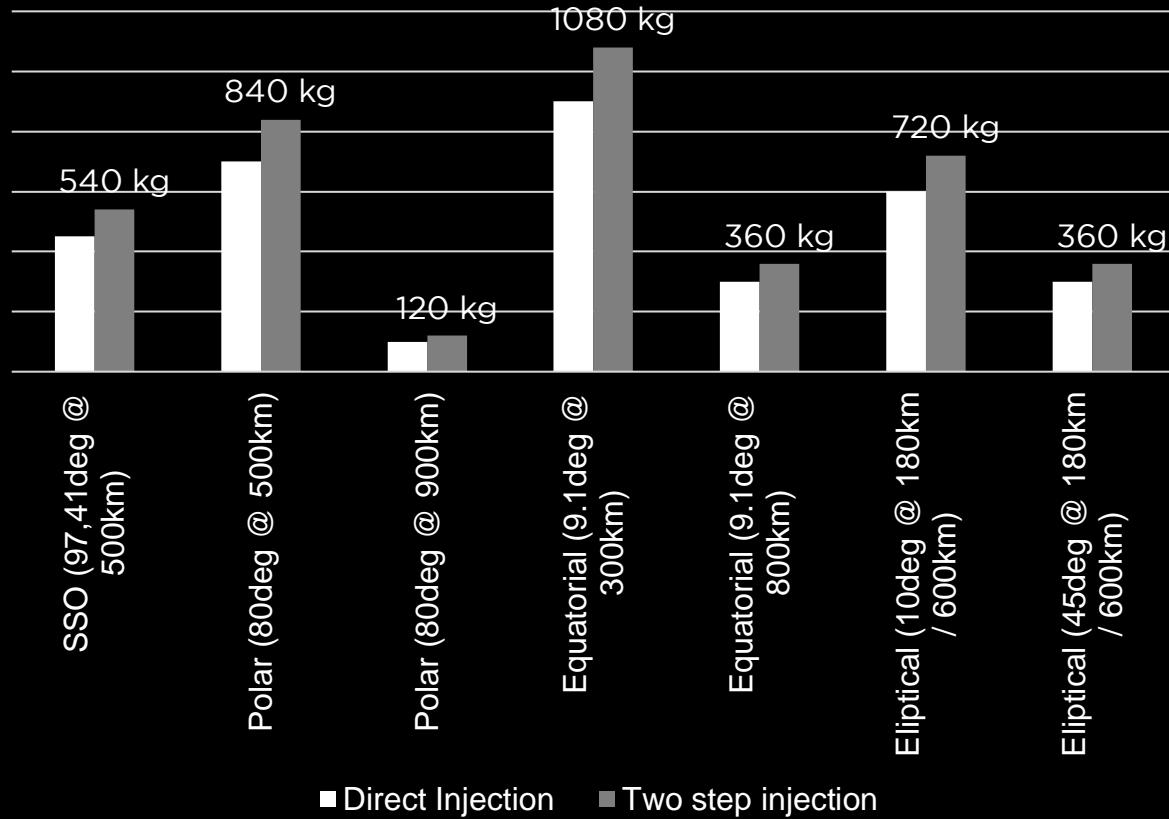


**LARGE,
CUSTOMISABLE
FAIRING FOR
SMALL ROCKET.
VOLUME WILL NOT
A PROBLEM**



PERFORMANCE

MIURA 5 transport capacity (kg) from French Guiana



FAIRING:
HEIGHT- 5.5m
DIAMETER - 2.2 m

VERY RELIABLE. VERY ACCURATE.

Orbital Injection Accuracy

	Worst case
Single/Main Payload	
Semi-major axis (a)	± 10 km
Eccentricity (e)	± 0,0025
Inclination (i)	± 0,1 deg
RAAN (Ω), for high inclination orbits	± 0,15 deg



Payload Separation Sequence

	Worst case
Spin stabilized mode	
Maximum spin rate	30 deg/s
Spin rate accuracy	± 1,5 deg
Transverse angular rates	≤ 2 deg/s
Spin axis orientation	≤ deg (half-cone)
Spin around longitudinal axis	≤ 0,5 deg/s

3-axis stabilized mode	Worst case
Axis de-pointing	≤ 1,5 deg
Angular rates	≤ 0,5 deg/s

REUSABLE MISSION.

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TECHNOLOGY MIGRATION FROM MIURA 1 TO MIURA 5

MIURA 5 will inherit all the experience acquired with MIURA 1: lower development risk (70-80% technology transfer)

For those few subsystems not directly transferable (e.g. turbopump assembly), we have employed parallel make-and-buy approaches to mitigate risk.



WE BUILD ROCKETS

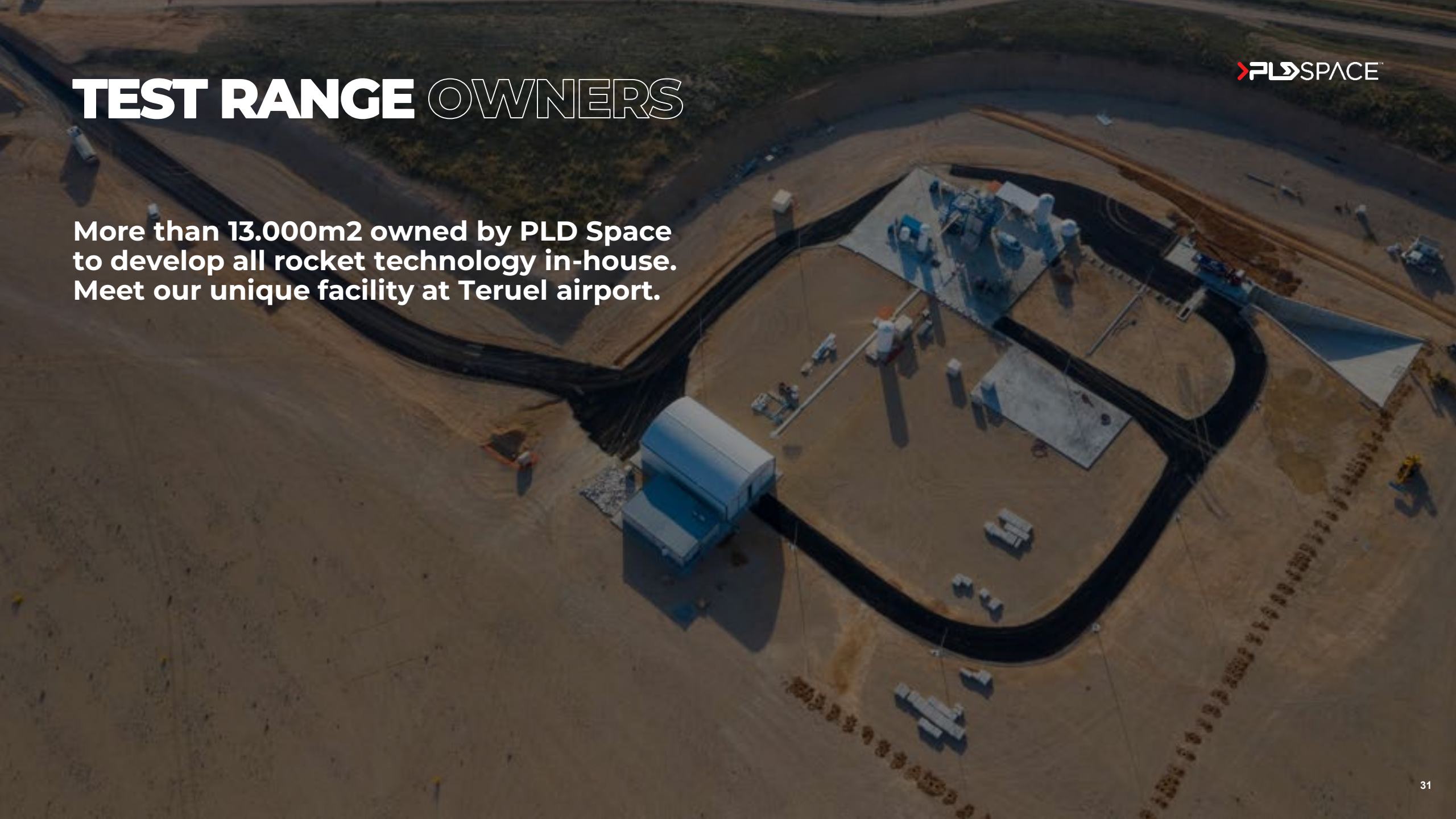
PLD Space has the industrial capacity and knowledge to manufacture its own rockets at its premises.



[LINK YOUTUBE THIS IS HOW WE BUILD ROCKETS IN PLD SPACE](#)

TEST RANGE OWNERS

More than 13.000m2 owned by PLD Space to develop all rocket technology in-house. Meet our unique facility at Teruel airport.



START YOUR **ENGINES**

7+ years developing liquid rocket engines. Mature, reliable and cost-effective engines developed by PLD Space to propel MIURA into space.



[LINK YOUTUBE FULL MISSION TEST MIURA 1](#)

AVIONICS AND FLIGHT SOFTWARE

The brain of MIURA was developed by the PLD Space shareholder GMV in collaboration with subcontractors.

ROCKET STRUCTURES

PLD space designs, tests, and manufactures all rocket structures.

Sheet metal comes in and rockets go out at our headquarters in Elche (Spain).

RECOVER IT

MIURA may be recovered from the sea using a brilliant strategy: Parachutes.

Our parachutes were produced by the same company that led the development of those used in the Apollo program.



THE CONCEPT WAS **PROVEN** IN 2019



[LINK YOUTUBE DROP TEST MIURA 5 DEMONSTRATOR](#)



SELECTED BY FRENCH GOVERNMENT (CNES/CSG) TO BE A LAUNCH OPERATOR IN KOUROU



MIURA 5 LAUNCH CAMPAIGN

Phases		
Phase 1	...to D-15	Arrival of launcher and payload containers at harbour / airport
Phase 2	D-15	Transport from harbour / airport to the Integration Building
Phase 3	D-15 to D-7	Launcher preparation and payload preparation
Phase 4	D-7 to D-6	Combined operations (launcher and payload)
Phase 5	D-6 to D-1	Final assembly
Phase 6	D0	Launcher transfer to launch pad
Phase 7	D0	Launcher stand-by (until countdown)
Phase 8	D0	Launch (until payload deployment)
Phase 9	D0 to D+1	1 st stage recovery post-flight operations *
Phase 10	D+1	Revalidation of the launch pad **
Phase 11	D+2	Departure of recovered stage, material and container(s) to Spain (TBC) ***

- * Not considered for first flights (MIURA block 1.0)
- ** It is desirable for PLD Space but will be included for MIURA block 1.1
- *** Not considered for first flights (MIURA 1.0) but introduced for block 1.1

Kourou

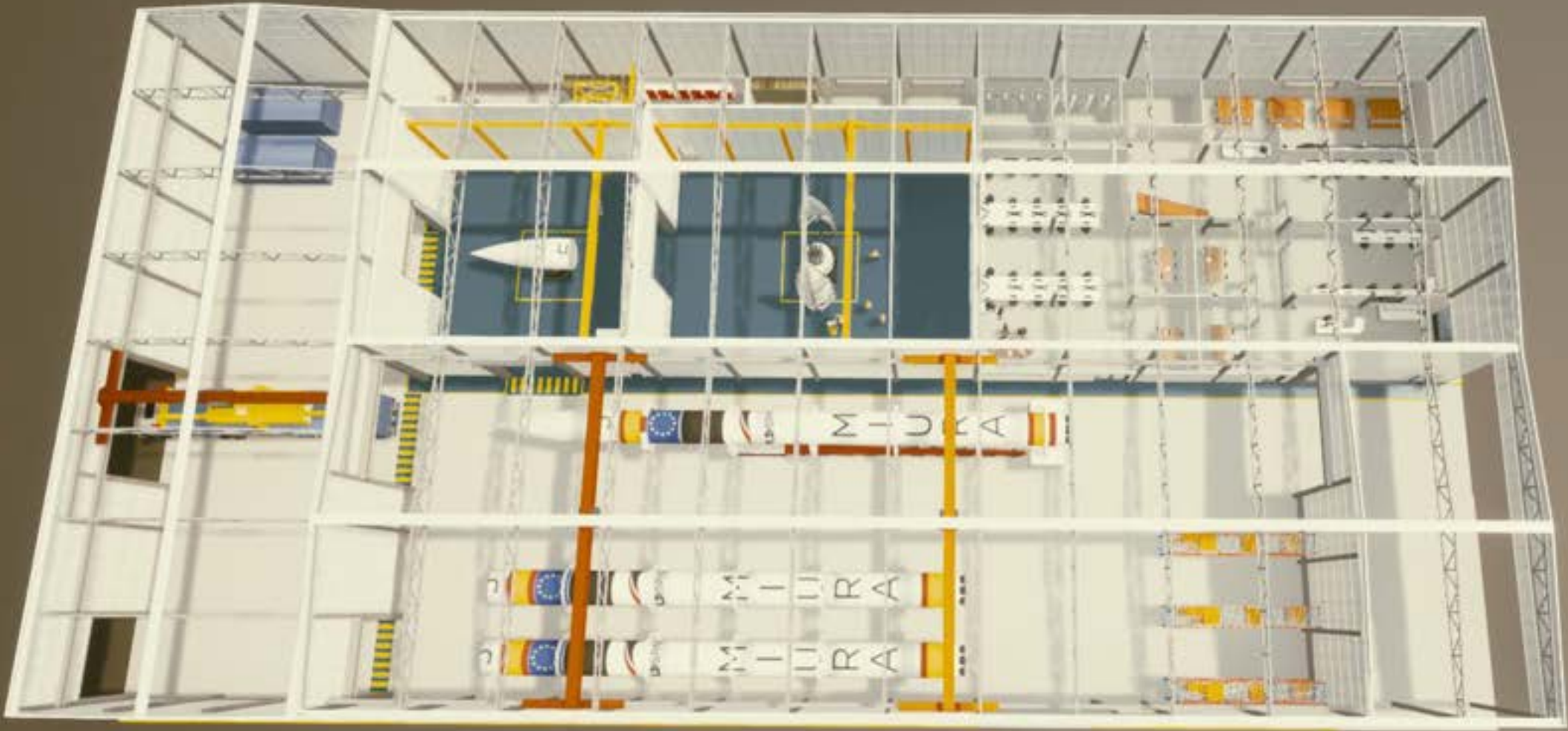
2024-25

Preparation Zone: 3.000m²

- Integration Hangar
- Cleanroom ISO8
- Airlock area
- PLD Office
- Customer office x2
- Control room

Launch Zone: 900m²





MIURA 5 FACILITIES - ELCHE



Just **6km away** from current
PLD SPACE HEADQUARTERS

PHASE 1 2024



An aerial photograph of a large industrial facility. The main building has a vast roof covered in solar panels. The 'PLSPACE' logo is visible on the side of the building. In the foreground, a white truck with a trailer is parked on a road. To the left, there is a parking lot with several cars. The surrounding area includes some landscaping with palm trees and a small white utility building.

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INFRASTRUCTURES

ELX03

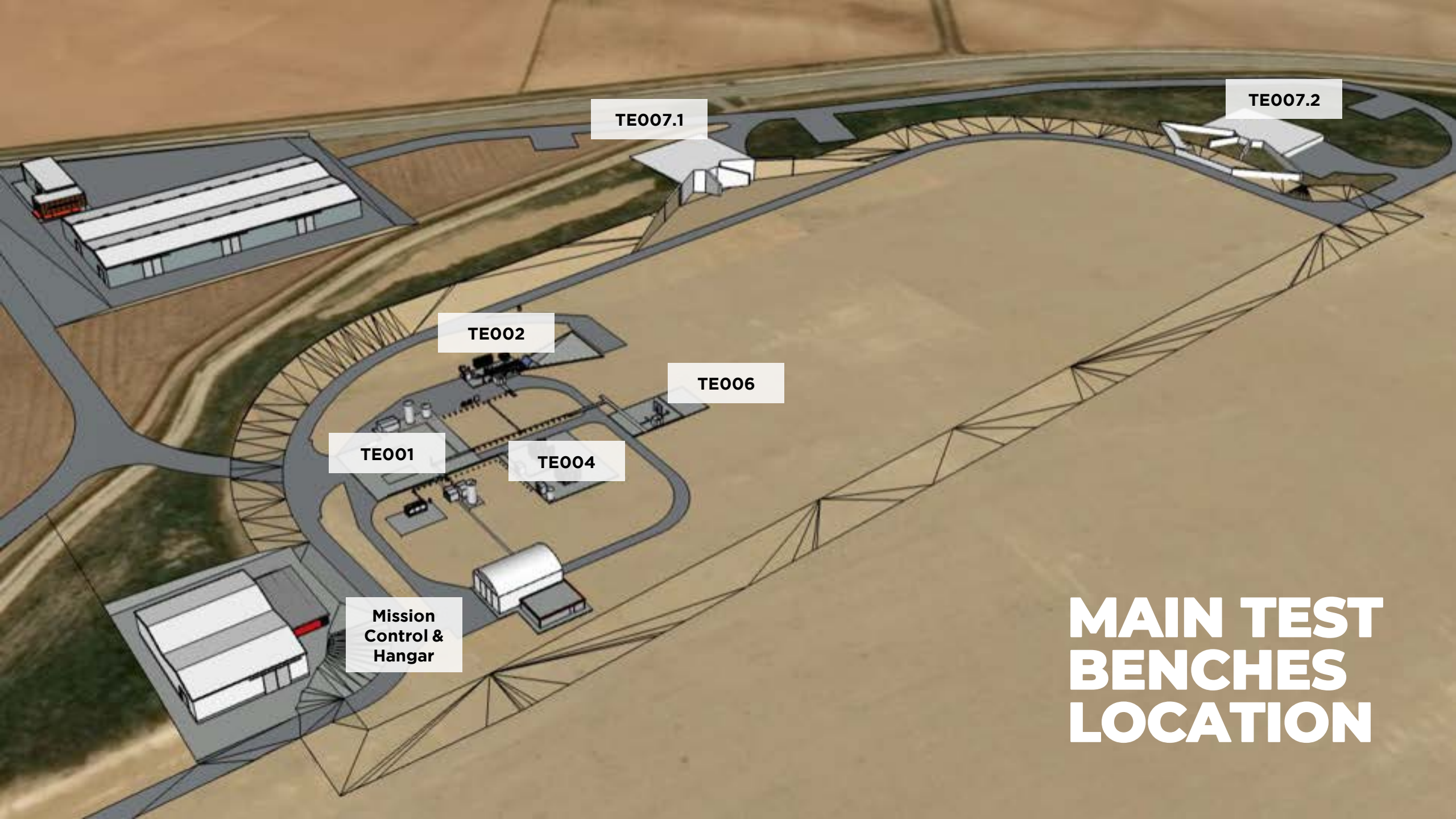
Structures



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MIURA 5 – TESTING FACILITIES (TERUEL)



TE007.1

TE007.2

TE002

TE006

TE001

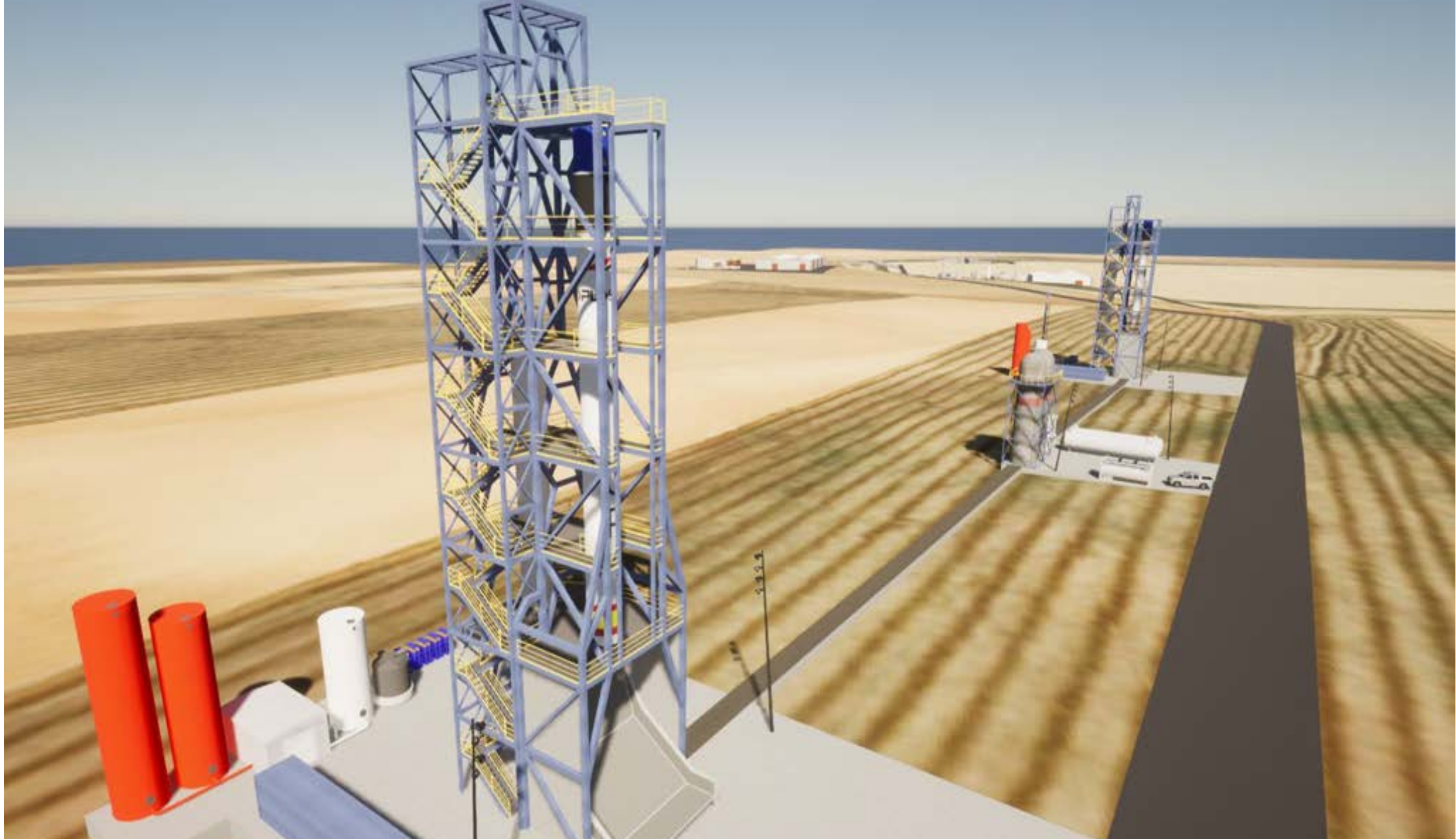
TE004

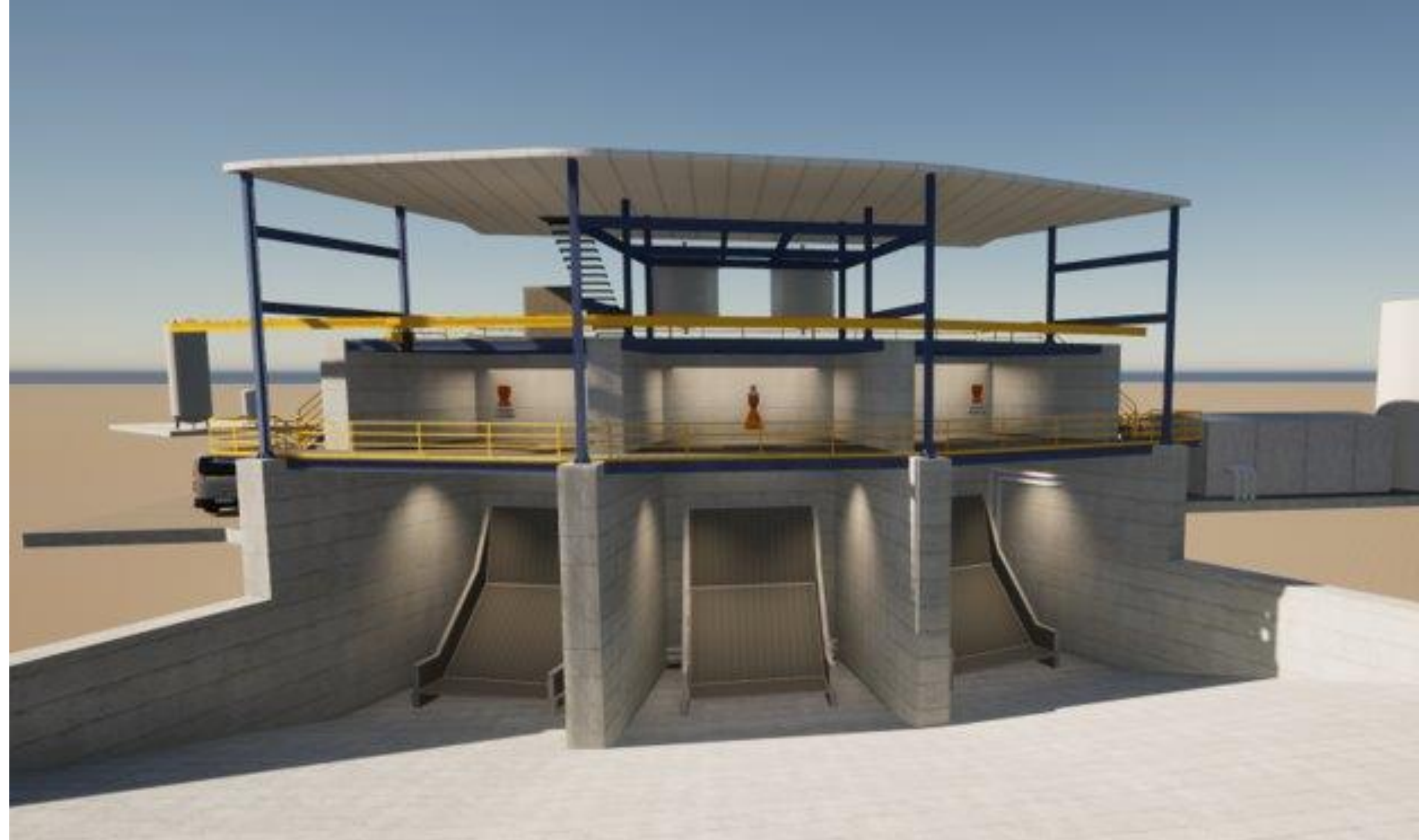
Mission
Control &
Hangar

MAIN TEST BENCHES LOCATION



TEST BENCHES





ROAD MAP TO SPACE

High level of technical readiness and a vertically integrated supply chain

DONE

- 2011 – PLD Space foundation
- 2013 – First investment round
- 2014 – Test bench at Teruel established
- 2016 – First ESA contract
- 2017 – Elche HQ established
- 2019 – Successful test of reusability system
- 2020 – First commercial contract
- 2021 – MIURA 1 engine successfully qualified
- 2022 – Start of Teruel test facility expansion
- 2022 – Successful full-system MIURA 1 static fire

PENDING

- 2023 – Manufacturing expansion
- 2023 – MIURA 1 launch
- 2025 – MIURA 5 launch
- 2026 – Commercial operations begin
- 2027 – Gigafactory complete

MIURA 5 RAMP-UP: SLOW, STEADY, THEN RAPID ACCELERATION.

OUR LAUNCH MANIFEST (THE REAL ONE)

	2024	2025	2026	2027	2028	2029	2030
COMMERCIAL LAUNCHES			5	10	16	24	30
QUALIFICATION LAUNCHES		1	1				
	○	○	○	○	○	○	○
	2024	2025	2026	2027	2028	2029	2030
Kourou	>>>	>>>	>>>	>>>	>>>	>>>	>>>
Other(s) Space Port(s)				>>>	>>>	>>>	>>>

OUR BEST ASSET:

160 SPACE ENTHUSIASTS
WORKING HARD TO BRING THE
MIURA ROCKET FAMILY TO LIFE.



“THANK YOU AMIGOS”

PABLO GALLEGO

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