



D-ORBIT

Solutions for our Future

Luca Rossetini, CEO

Our Mission – Clean and Safe Access to Space



Preserve the orbital space while promoting a clean and safe access to space

- D-Orbit is focused on stopping the systematic increase of concentration of uncontrolled objects in space, promoting a sustainable access to Space and adding a fourth dimension to the common notion of sustainability: Earth, Air, Sea and Space.

Provide our customers with suitable decommissioning solutions

- Based on technology qualified for space applications
- Selected from a broad technology portfolio
- Developed using advanced and genuine methods
- Produced in modern state-of-the-art facilities and in partnership with well established players in the market
- Done by a skilled and careful workforce

Fields of activity

- Space debris mitigation and prevention
- Solid rocket motors and gas generators
- Special rocket motors
- Space grade electronic design and manufacturing
- Critical software (B class)
- Safe design and pyrotechnical devices for safety
- Special products and services

D-ORBIT



- Established in 2011. Now 21 people
- Financial support by Italian Venture Capital funds
- Raised about €2.5m by:



Los Angeles, CA



Lomazzo, Italy



Lisboa, Portugal



Sesto Fiorentino, Italy

AWARDS

- 2014: MassChallenge finalist (100 selected among 51 nations)
- 2014: European Space Agency award at ESA Investment Forum
- 2013: Red Herring global winner (100 most innovative worldwide ventures)
- 2012: MIT Tech Review: among the 12 most Italian innovative companies
- 2012: MIT Portugal IEI finalist (award won: 100k€)
- 2012: Talento delle Idee Area Centro-Nord First Place
- 2011: Working Capital & "Premio Nazionale Innovazione" Finalist
- 2011: Mind The Bridge Business Plan Competition Finalist
- 2011: Bassetti Award: most responsible startup
- 2010: Rice Business Plan Competition Finalist

D-Orbit production facility



Engineering design area



ISO 5 – 100'000 class
CLEAN ROOM



Brainstorming and innovation area

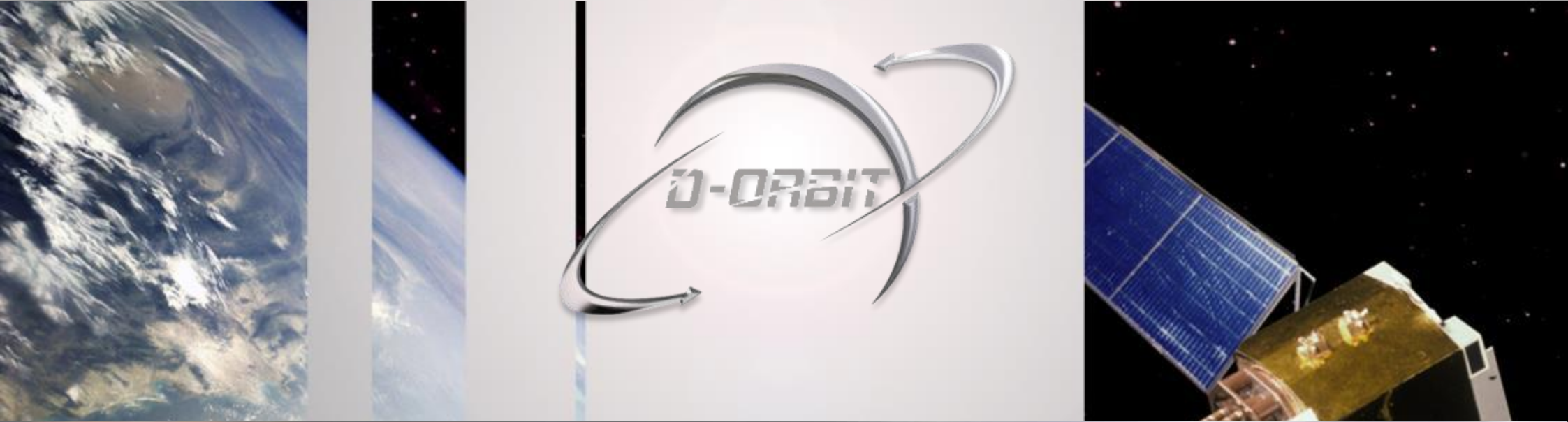


- Mechanical workshop
- Space grade painting area
- R&D small tests area
- Electronic and electromechanical production area

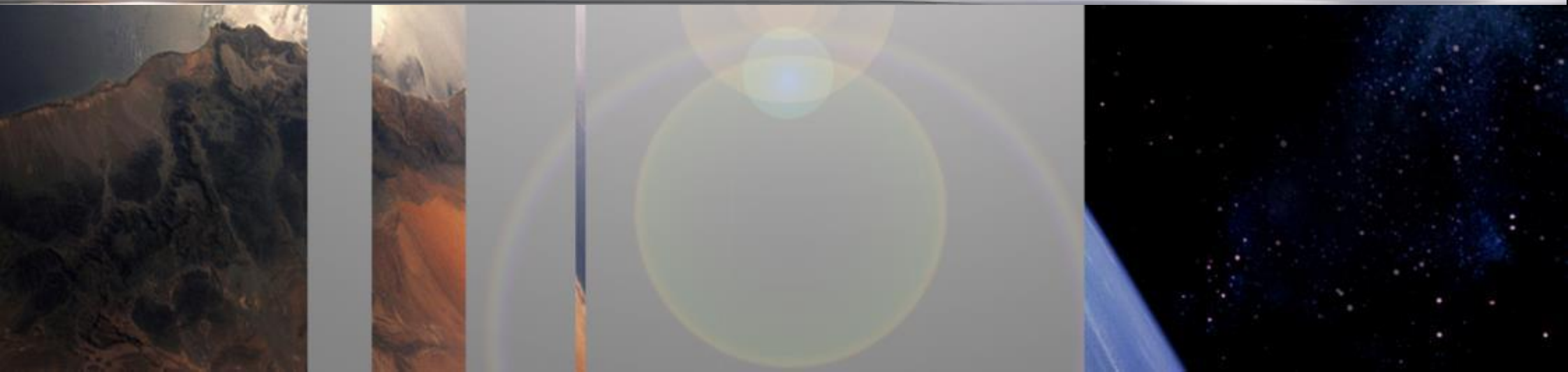


Partnership with





SPACE DEBRIS MITIGATION REGULATIONS



WORLDWIDE REGULATIONS



INTERNATIONAL	UN COPUOS, IADC, ISO 24113 Limit the long-term presence of spacecraft and launch vehicle in orbit after the end of their mission; Mandatory post-mission disposal manoeuvre.			
	LEO	GEO	MEO	LAUNCHERS
EUROPE	French Law, ESA Casualty risk $< 10^{-4}$: reentry within 25 years. Casualty risk $> 10^{-4}$: direct reentry. 'Best effort' principle.	French Law, ESA, ITU Mandatory disposal manoeuvre in graveyard orbit. Required success rate 90%.	French Law, IADC, ITU, ESA Mandatory disposal manoeuvre in graveyard orbit. Generation of debris not allowed.	French Law, ESA Limit the presence in operational orbit to 1 year. Mandatory disposal manoeuvre. 'Best effort' principle.
UNITED STATES	NASA, NOAA, FAA, DOD Reentry in 25 years AND casualty probability $< 10^{-4}$.	NASA, FCC, FAA, ITU Mandatory disposal plan and manoeuvre for optaning licensing.	NASA, FCC, FAA, DOD Mandatory disposal plan and manoeuvre for optaning licensing.	NASA, NOAA, FAA, DOD Mandatory disposal by: atmosperic re-entry, storage orbit, direct retrieval.
JAPAN	JAXA Reducing to minimum post mission time of interference with LEO region.	JAXA Mandatory transfer to higher orbit.	JAXA Mandatory disposal plan and manoeuvre for optaning licensing.	JAXA Reducing to minimum post mission time of interference with useful orbits.

DECOMMISSIONING SOLUTIONS



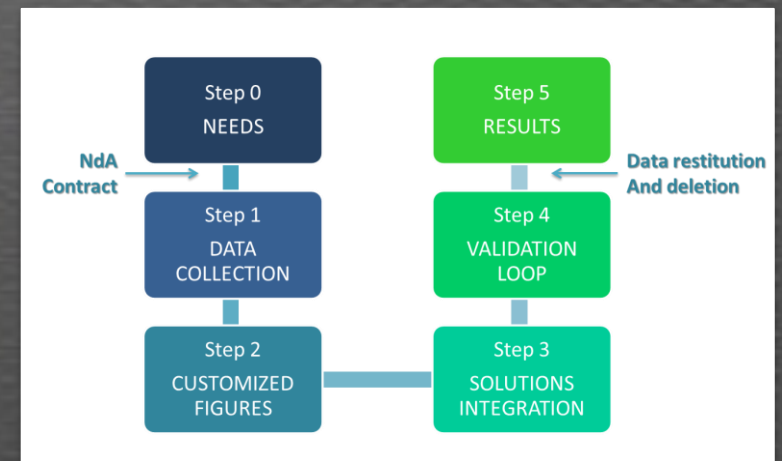
D-TEAM

Expertise in decommissioning solutions

D-TEAM's main objective is to support Mission Analysis specialists and System Engineers to evaluate the best technologies and strategies to adopt to be compliant with current and upcoming regulations on space debris mitigation.

DISRuPT

DISRuPT is a detailed and customized analysis and debris prevention strategies' investigation for satellite platforms



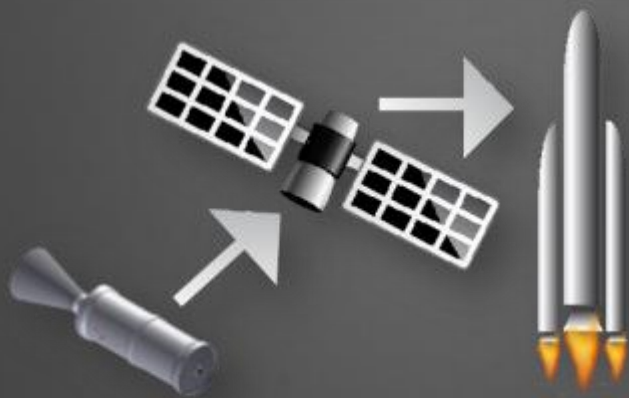
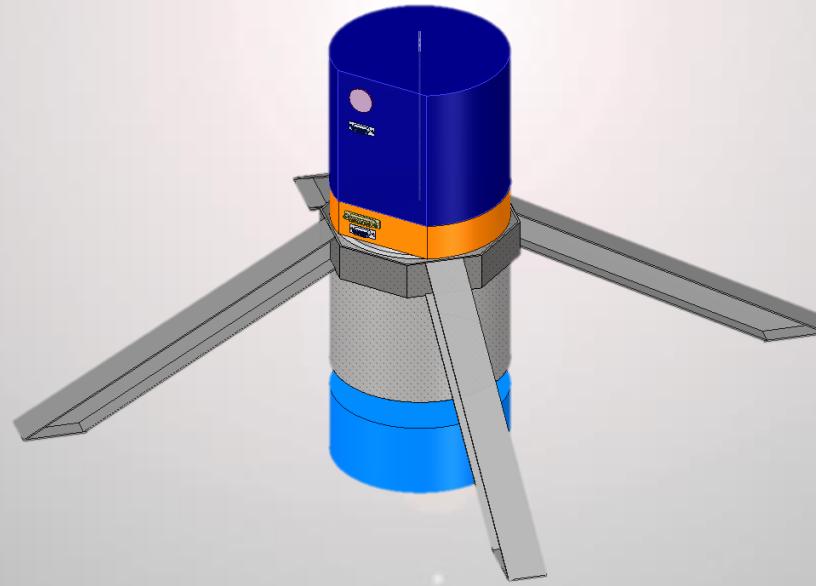


D-Orbit decommissioning solutions

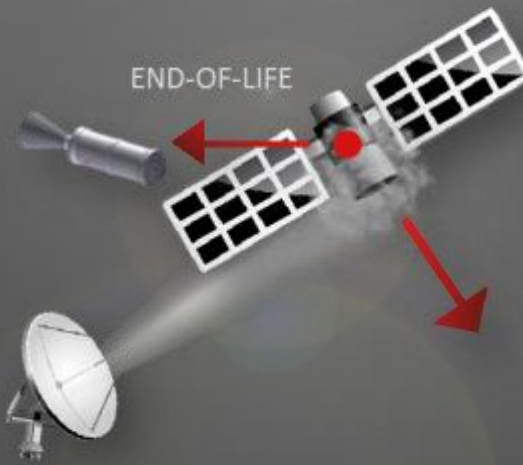
are compliant with current and incoming regulations.

Satellite manufacturers can bid with a dedicated solution for the decommissioning problem.

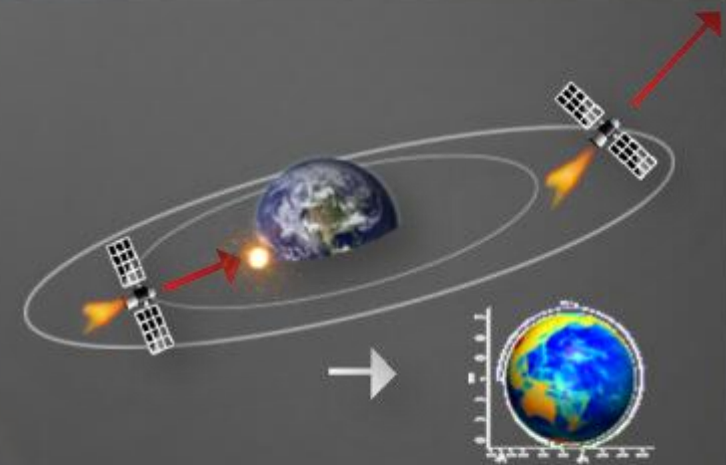
D-ORBIT DECOMMISSIONING DEVICE



Unique and patent pending (11 countries) smart propulsive device, easy to install before launch



Independent from the satellite, it may work even if the satellite does not



Safe, controlled and quick decommissioning (few hours) both for LEO and GEO satellites

D-ORBIT DECOMMISSIONING DEVICES: D3

COMPETITIVE ADVANTAGE

INDEPENDENT

LIFE EXTENSION

SIMPLER OPERATIONS

AUTONOMY*

LOWER COSTS

COMPACT, MODULAR AND SCALABLE

DEFENCE STRATEGIC IMPLICATIONS



COMPULSORY FEATURES

CONTROLLED REENTRY

QUICK RE/DEORBIT

NON-INTERFERENCE

HIGHER SUCCESS RATE

BEST EFFORT

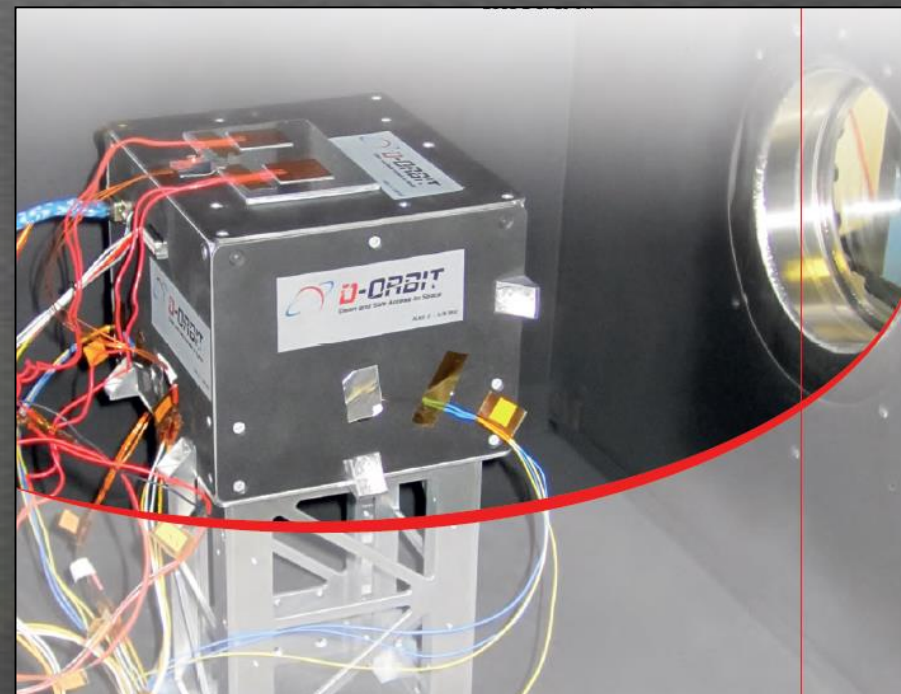
D-ORBIT HERITAGE



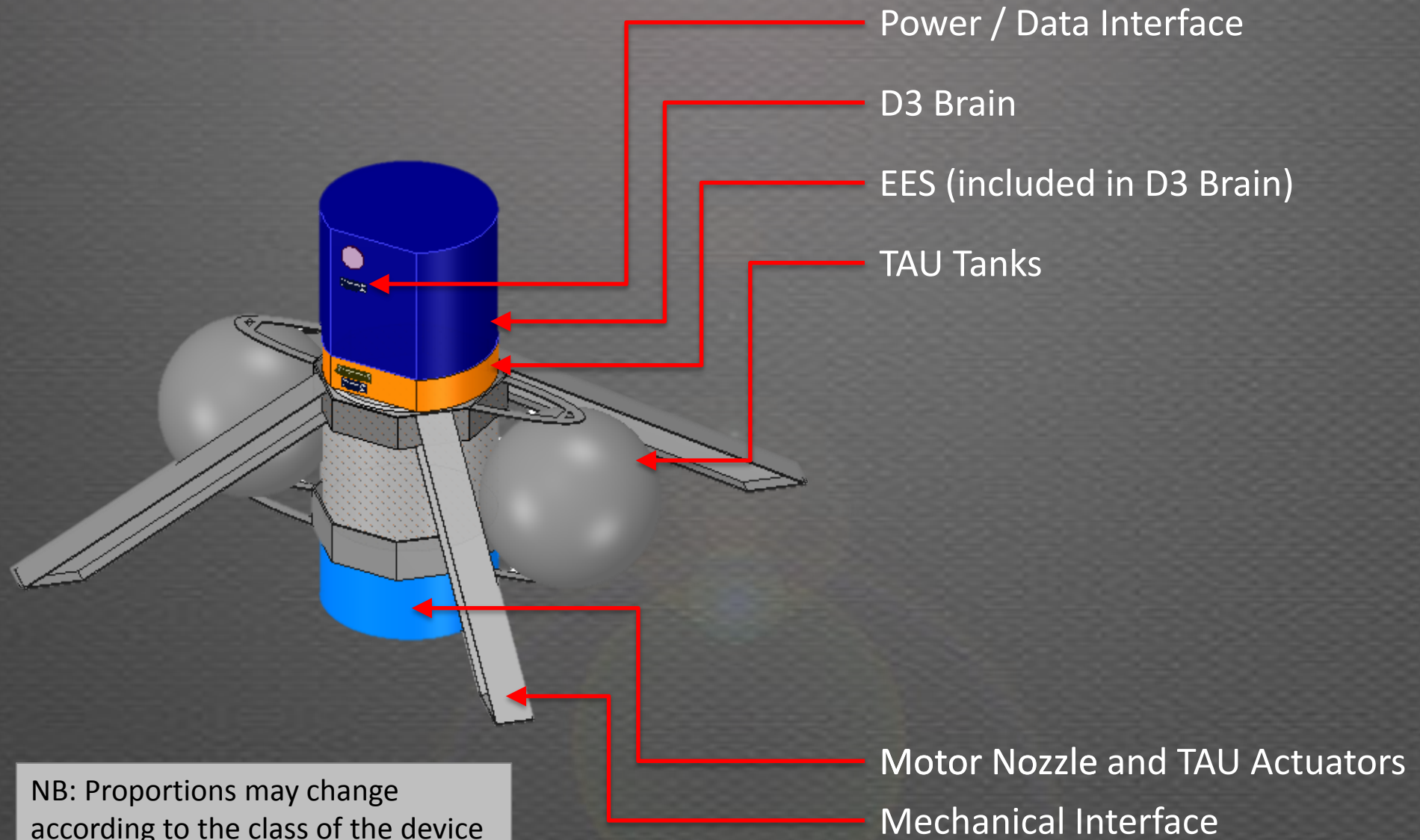
A demonstrator solid propellant motor engineering model was successfully tested on ground in 2012. The 42 cm long and 19.5 cm diameter motor provided 16.2 KN thrust for 1.4 seconds.

On November 21st, 2013, D-Orbit's **ALICE2** mission was launched on a Dnepr rocket from Yasni, Russian Federation. **ALICE2** included a Command & Control Unit and two Safe & Arm Devices mounted on the UniSat-5 unit.

The mission objective was to attain the space qualification standardized procedures and the launch acceptance tests. **ALICE-2** passed electrical and functional tests, thermal-vacuum tests, vibration tests and EMC tests. Final functional and flight accepting testing were performed in compliance with European Cooperation for Space Standardization's **standard ECSS-E-ST-10-03C, ECSS-E-ST-10-04C and ECSS-E-ST-20-07.**



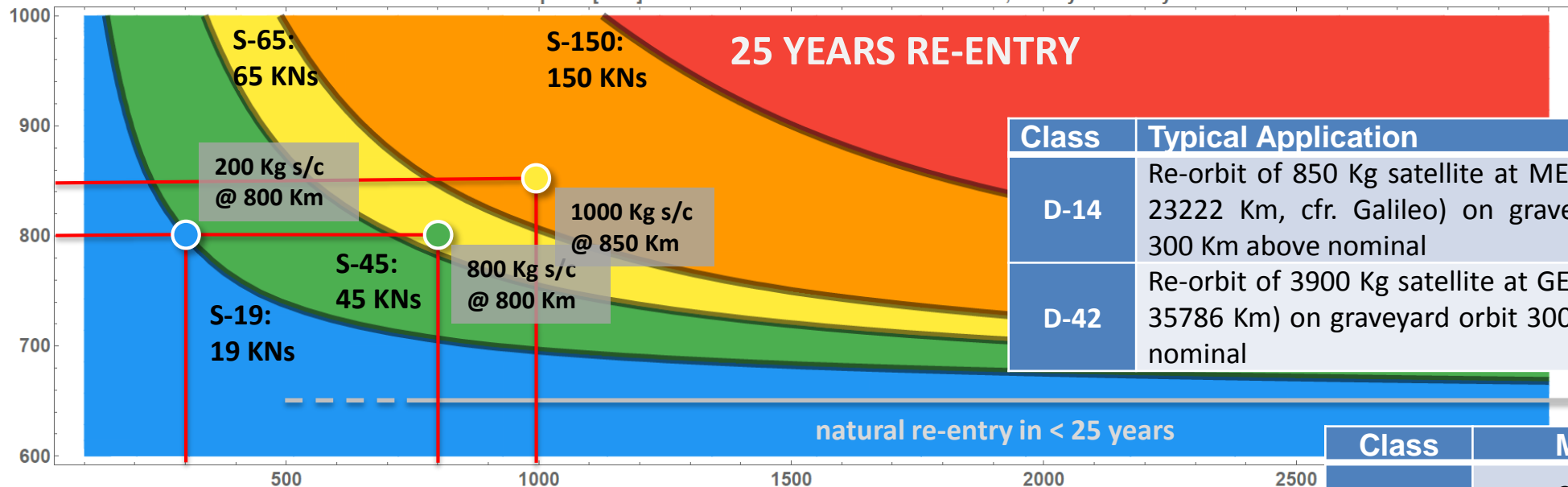
D3 VIEW



D3 CLASSES



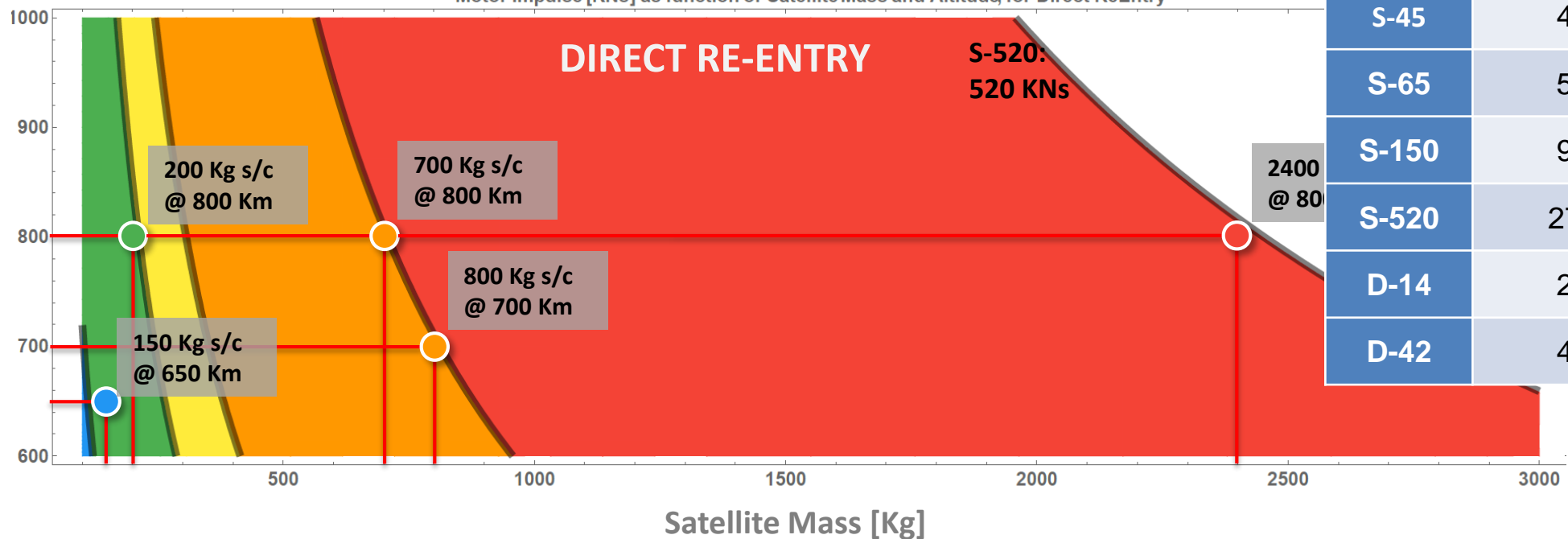
Motor Impulse [KNs] as function of Satellite Mass and Altitude, for 25yrs ReEntry



Class	Typical Application
D-14	Re-orbit of 850 Kg satellite at MEO (altitude 23222 Km, cfr. Galileo) on graveyard orbit 300 Km above nominal
D-42	Re-orbit of 3900 Kg satellite at GEO (altitude 35786 Km) on graveyard orbit 300 Km above nominal

Class	Mass
S-19	25 kg
S-45	40 kg
S-65	50 kg
S-150	95 kg
S-520	270 kg
D-14	25 kg
D-42	40 kg

Motor Impulse [KNs] as function of Satellite Mass and Altitude, for Direct ReEntry



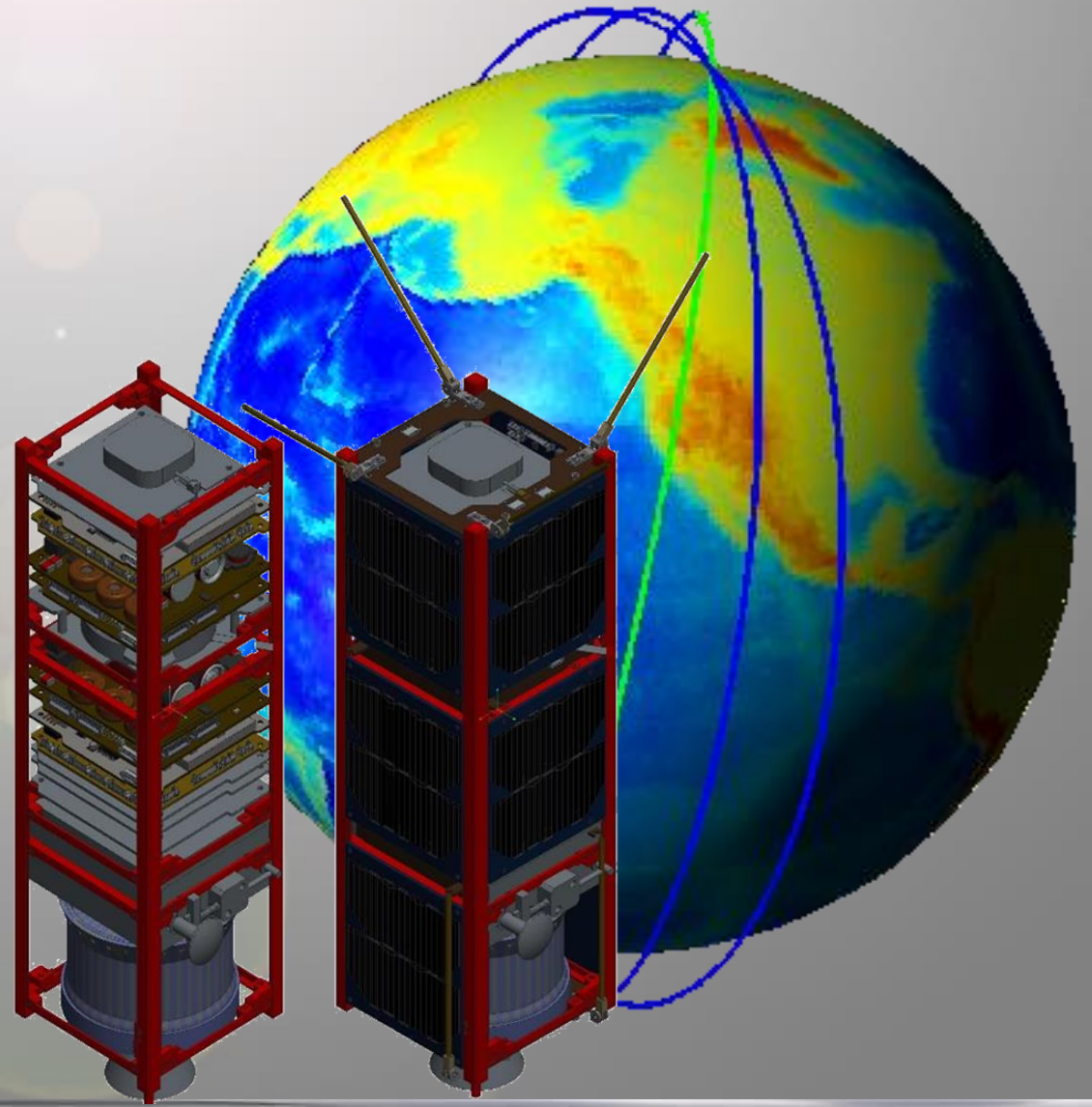
Satellite Mass [Kg]

DECOMMISSIONING DEMONSTRATION D-SAT



**FIRST SATELLITE
REMOVED
IN A QUICK, SAFE
AND
CONTROLLED
MANNER**

D-ORBIT Decommissioning Device
fully qualified for space applications

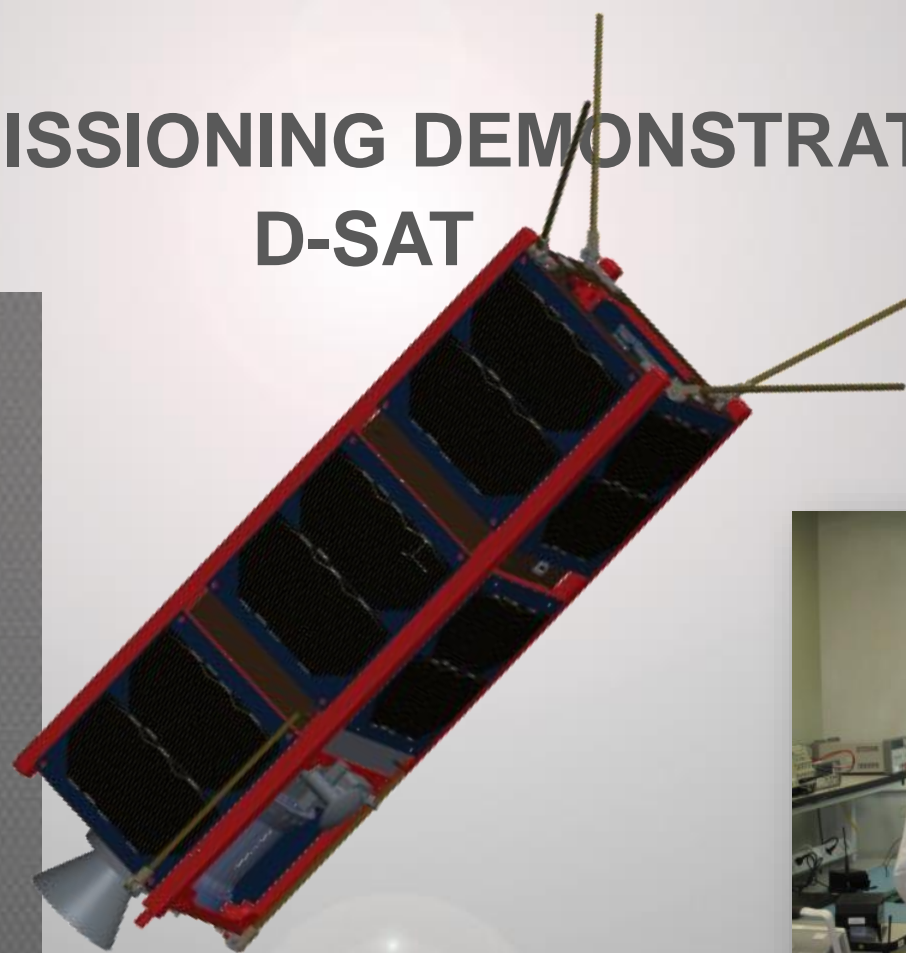


DECOMMISSIONING DEMONSTRATION D-SAT



- Design review: OK
- Procurement: OK
- Parts validation: OK
- Assembling qualification model: in progress

**UNSOLICITED
PROPOSAL FOR
NASA-CASIS
SPONSORSHIP:
LAUNCH APPROVED**



QUALIFICATION LOGIC

Platform qualification concept: similar to liquid propulsion, probably less critical...

Satellite manufacturer side:

- **Inert Device with EES (Nasa standard initiator or equivalent EED)**
- **Identical electrics/electronics, form and fit representative, mass and inertia representative**
- **Safe satellite qualification, no special handling, no special building**

Tested at solid rocket motor manufacturer:

- **Live device (with propellant), mounted on a satellite frame replicating satellite environment**
- **Device qualified to expected loads**

Transportation to the launch site & integration

- **Integration on the satellite at CSG or other launch site; CoG alignment with mechanical interface (beams with pivot & linear guide); no toxic liquid, no spillage, tanks, valves, etc.**

DEVELOPMENT AND QUALIFICATION PLAN

Device qualification from ATP

- Qualification of a SRM (12-18 months from ATP, ROM available from several manufacturers)
- EES qualification (ongoing, available in 2015, plan is before the summer break)
- D3 Brain qualification (12 months from ATP)
- TAU development and qualification: 18 months
- D3 complete integration and qualification: 24 months



OUR RESPONSIBILITY

Every profitable choice should be sustainable.

Every responsibility should take care of who we care most.



Contact person:

Luca Rossetini, CEO

Tel US: +1 (415) 684-3673 / +1 (805)-304-0363

Tel Europe: +39 340 760 7035 / +39 02 3671 4010

Email: luca.rossetini@deorbitaldevices.com



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Solutions for our Future

www.deorbitaldevices.com

Headquarters: Milano, Via Mazzini 2, 20123 ITALY

Operating Office: ComoNext Technology Park, Via Cavour 2, 22074 Lomazzo (CO) – ITALY – Tel: +39 3671 4010

Administrative Office: Sesto Fiorentino (FI), Via Madonna del Piano 6, 50019 – ITALY - Tel: +39 055 457 4666

D-ORBIT INC. – Simi Valley, CA 93062, USA - Tel.: +1 (805) 304 9567

Email: info@deorbitaldevices.com