



D-ORBIT

SPACE ORBITAL SOLUTIONS

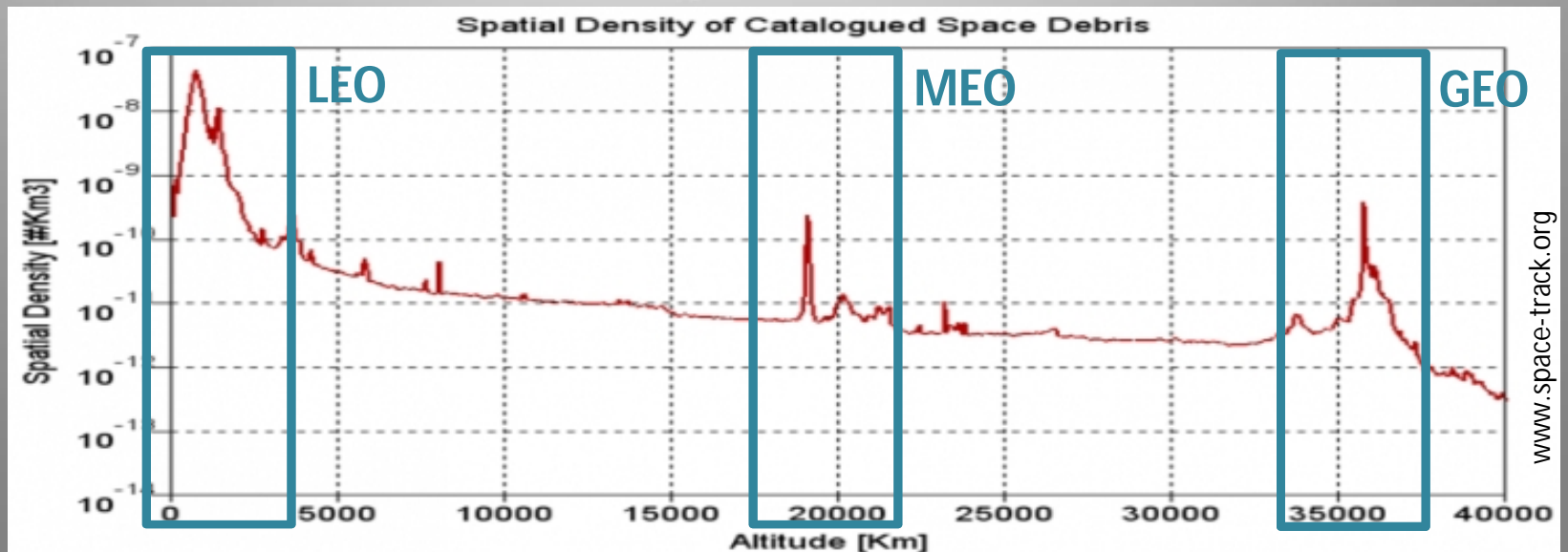
Renato Panesi

Space debris threat: the problem

Space is big, but useful space is crowded.

The exponential increase of objects in operational orbit leads to a continuously increasing risk in satellites collision

- Revenues loss due to waste of fuel on anti-collision maneuvers
- Impossibility to use over-crowded orbital slots
- Launch trajectories must avoid debris



Space debris threat: the need

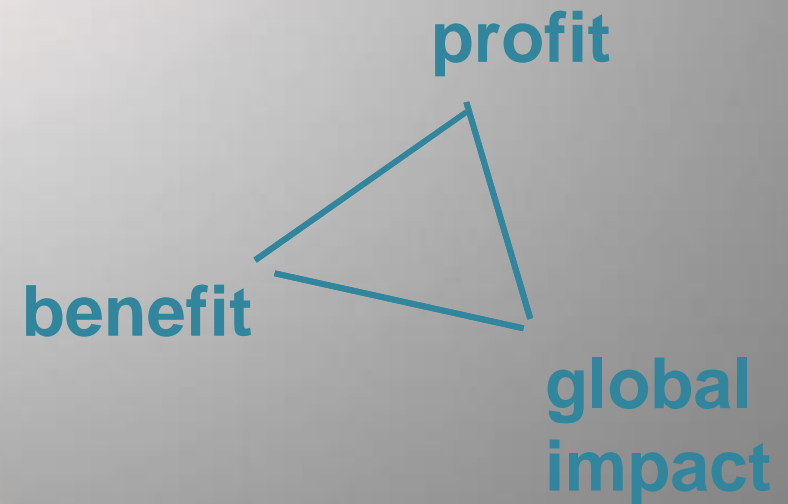
INTERNATIONAL	UN COPUOS, IADC, ISO 24113 Limit the long-term presence of spacecraft and launch vehicle in orbit after the end of their mission; Mandatory post-mission disposal maneuver.			
	LEO	GEO	MEO	LAUNCHERS
EUROPE	French Space Act, ESA Baseline: controlled atmospheric reentry (casualty risk $< 2 \cdot 10^{-5}$). If compliance is impossible (duly justified) reentry within 25 years with casualty risk $< 10^{-4}$. 'Best effort' principle.	French Space Act, ESA, ITU Mandatory disposal manoeuvre in graveyard orbit. Required success rate 90%.	French Space Act, IADC, ITU, ESA Mandatory disposal manoeuvre in graveyard orbit. Generation of debris not allowed.	French Space Act, ESA Baseline: controlled atmospheric reentry. Limit the presence in operational orbit to 1 year. Mandatory disposal manoeuvre. 'Best effort' principle.
UNITED STATES	NASA, NOAA, FAA, DOD Compliance with ISO 24113. Reentry in 25 years AND casualty probability $< 10^{-4}$.	NASA, FCC, FAA, ITU Mandatory disposal plan and manoeuvre for obtaining licensing.	NASA, FCC, FAA, DOD Mandatory disposal plan and manoeuvre for obtaining licensing.	NASA, NOAA, FAA, DOD Mandatory disposal by: atmospheric 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 obtaining licensing.	JAXA Reducing to minimum post mission time of interference with useful orbits.

The D-Orbit solution

D-Orbit aims to market efficient, modular and scalable decommissioning devices for all satellites and launcher classes,

As first-mover in the market of decommissioning devices, D-Orbit is leading the future in space debris management and mitigation technology.

D-Orbit is committed to promote a sustainable, durable and efficient growth of outer space resources.



ONE CORE TECHNOLOGY FOR SATELLITE COMMISSIONING AND END-OF-LIFE DISPOSAL - LIGHT, LOW COST AND AUTONOMOUS

Satellite Decommissioning System – D3:

- Smart systems based on **solid propellant rocket**
- Installed **pre-launch** on any satellite (LEO, MEO, GEO Orbits)
- Removal at **end-of-life** or failure in a quick, safe and direct deorbit trajectory

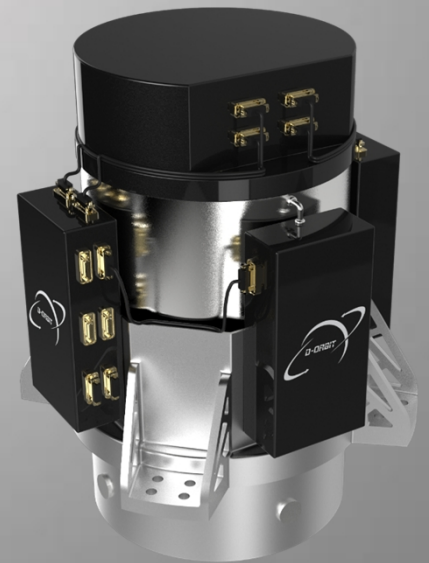
Launcher Decommissioning System – D-Launch:

- Core technology adapted for directly deorbiting upper stage launch segments

Satellite Orbit Raising System – D-Raise:

Adaptation of core technology (different products) to:

- **GEO:** rapidly reach revenue producing orbit of slow electrically-propelled satellites
- **LEO:** reduce cost to position small satellites in their operational orbits



*D3 Decommissioning
System*

Addressable Market

PRODUCT	D-Orbit ADDRESSABLE MARKET, UNITS / YR	D-Orbit ADDRESSABLE MARKET / YR \$M	MARKET SHARE IN YR 5
D-RAISE	20 units	\$30M	60%
D-LAUNCH	75 units	\$75M	37%
D3 LEO	520 units	\$26M	48%
D3 MEO	15 units	\$75M	53%
D3 GEO	35 units	\$175M	43%
TOTAL		\$ 381 M / YEAR	

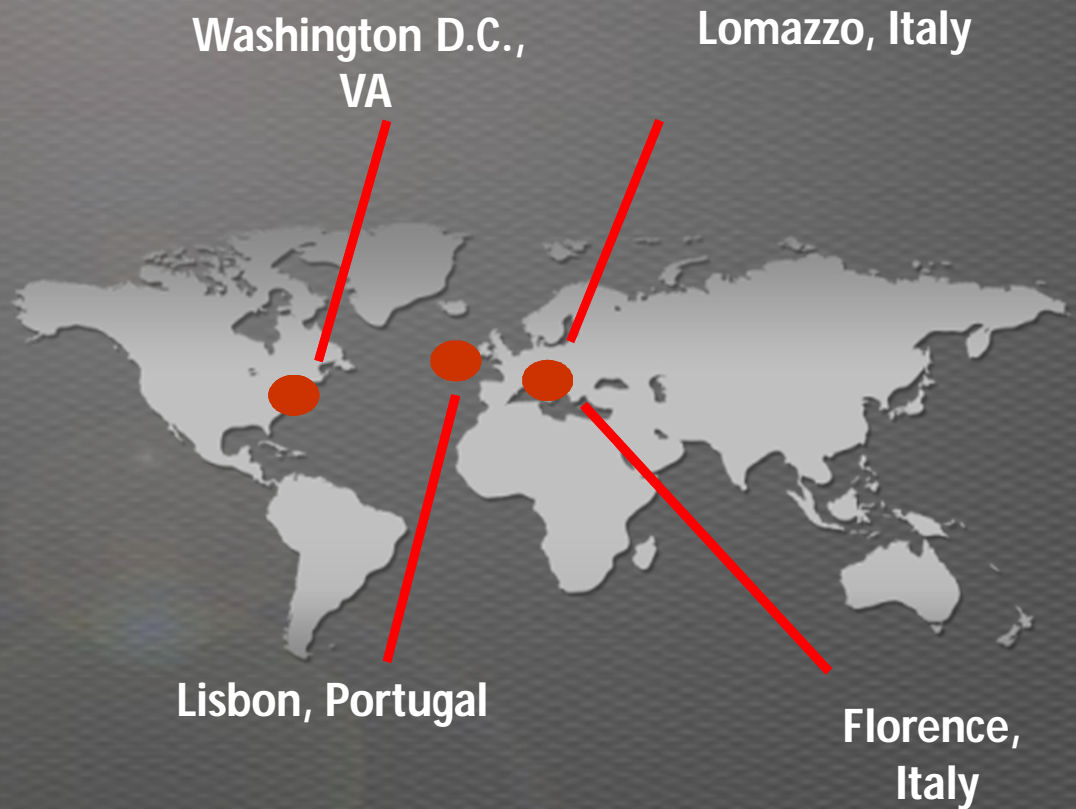
Our competitive Advantage

Characteristics	Independent Liquid Propulsion	Electric Propulsion	Passive Devices	On-Board Propulsion System	D-Orbit
Cost	—	—	+	+	+
Weight/Volume	—	+ / —	+	+ / —	+
Reliability	—	+ / —	—	—	+
Autonomy	—	—	—	—	+
Design Impact	—	—	+	+	+
Increase Satellite Life	+	+	+ / —	—	+
Direct Re-Entry	+	—	—	—	+
Time to Re-entry	+ / —	—	—	+ / —	+



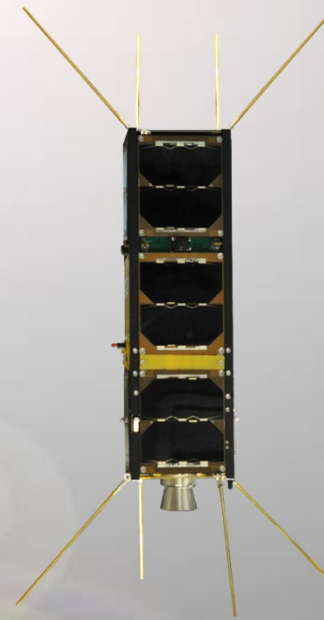
D-ORBIT

- Established in 2011
- patented technology/product solutions to decommission satellites and launchers
- First mover in satellite decommissioning and launcher deorbit markets
- Leader in Europe on solutions for space debris mitigation
- Staff of 30+ people, most of them holding a Ph.D., with consolidated experience in the market

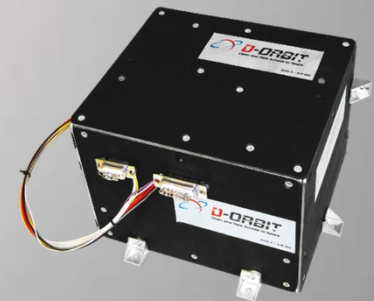


Space Heritage: Development Phases

- Live rocket motor testing
- System level patents filed
- On-Orbit demo of command process and ignition system
- Satellite integration and extensive testing (electronic, thermal, vacuum, vibration, shock)
- 2016 launch, operation and removal from orbit of company designed and built satellite
- European Space Agency (ESA) reaches independent conclusion that D-Orbit technology is optimal for satellite disposal



D-SAT MISSION
Q4 2016



ALICE 2 MISSION
November 21, 2013



SOLID MOTOR GROUND
TEST
January, 2012

MANAGEMENT



Luca Rossettini **CEO, FOUNDER**

Expert at Space Advisory Group of the European Commission. Board member of AIPAS (space SME industrial association), Board member of Confindustria Florence. Aerospace engineer with a Ph.D. in advanced space propulsion (Politecnico di Milano). Certificate in technology entrepreneurship (Santa Clara University), master in Strategic Sustainability, Fulbright Alumnus.



Renato Panesi **VP S&M, FOUNDER**

Marketing & sales area manager at Finmeccanica. Seven years of experience in R&D within Finmeccanica. Aerospace engineer with a Ph.D. in robust multivariable flight control systems (Università di Pisa). Certificate in technology entrepreneurship (Santa Clara University), Fulbright Alumnus.



Pietro Guerrieri **VP Biz Dev**

General Manager at SES Astra Italia. Former CEO of Milano Teleport SpA, former Satellite Operations Engineer at Eutelsat. Co-author of: "The legal discipline of financial activities in Outer Space". Pietro is helping D-Orbit developing a successful commercial strategy.



Robert W. Dean **CEO D-Orbit Inc.**

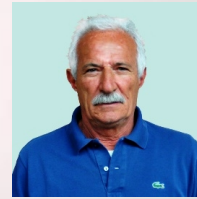
Vialogy LLC, CEO and Director. SAIC Inc., Corporate Senior VP, Market Development; Macdonald Dettwiler And Associates, Director; BOEING Space & Communications Co., VP Business Development; Lockheed Martin Missiles & Space Co., VP Strategic Planning & Business Development; Ball Aerospace Corp., Senior VP; THE WHITE HOUSE, Special Assistant to the President, National security Council



Elena Toson **Head of Programs**

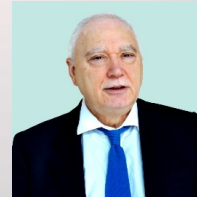
Technical Leader in Avio Aero, managing R&D GREAT 2020 projects. Green Belt certificate. Aerospace engineer with a Ph.D. in propulsion systems (Politecnico di Milano). Member of Space Propulsion Technical Committee. MIP Alumna

ADVISORS



Demetrio Masaro

Former Program manager, head of Engineering, head of Production (80 people) at Thales Alenia Space. Main European satellite programs managed: Earth Remote Sensing program: budget 60 M€; Galileo IOV program: budget 15 M€; Cosmo Skymed: budget 50 M€.



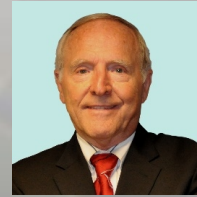
Francesco Di Tolle

Former CEO at Space Software Italia, CTO in Laben, Chief engineer digital and radar at Thales Alenia Space, Francesco held a class at Politecnico di Milano on Safe Electronic Systems.



Robert S. Manasse

Senior Advisor at Younicos AG, based in Berlin, Germany and Austin, Texas. Senior Advisor to Rollo Capital Management. Senior Vice President at ENEL Green Power in charge of Business Development, managing Director of their Commercial Finance Division, Vice President of Enron Europe.



Ron Clark

Former Director of Naval Technology at the Defense Advanced Research Projects Agency (DARPA). Director, Lockheed Martin Space Systems, Future Concepts and Analysis and Internal Research and Development. CEO and founder of Space Orbital Services, Dr. Clark holds 6 patents and holds a Ph. D. in Solid State Physics.



Marco Pascucci

Board member of Altec SpA, e-Geos SpA, Norsat International. He was board member of Italian Space Agency. Former President of ELV SpA. From 2000 to 2004 he was CEO of Laben S.p.A. Senior vice-president of Alenia Spazio SpA, R&D, Technology and New Initiatives Director. Senior Vice-President, Telecomm. and Remote Sensing Director.



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