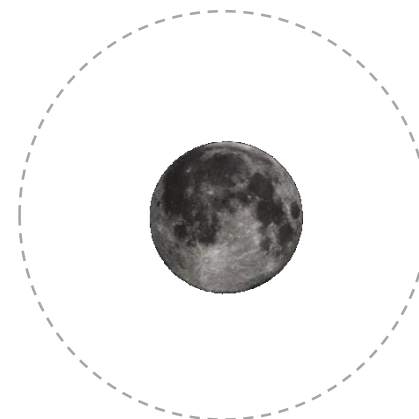




Building a Space Development Industry in Luxembourg

12 June 2018

*Lamboray Bob
Ministry of the Economy
Grand Duchy of Luxembourg*



9th Joint Space Resources Roundtable
Planetary & Terrestrial Mining Sciences Symposium

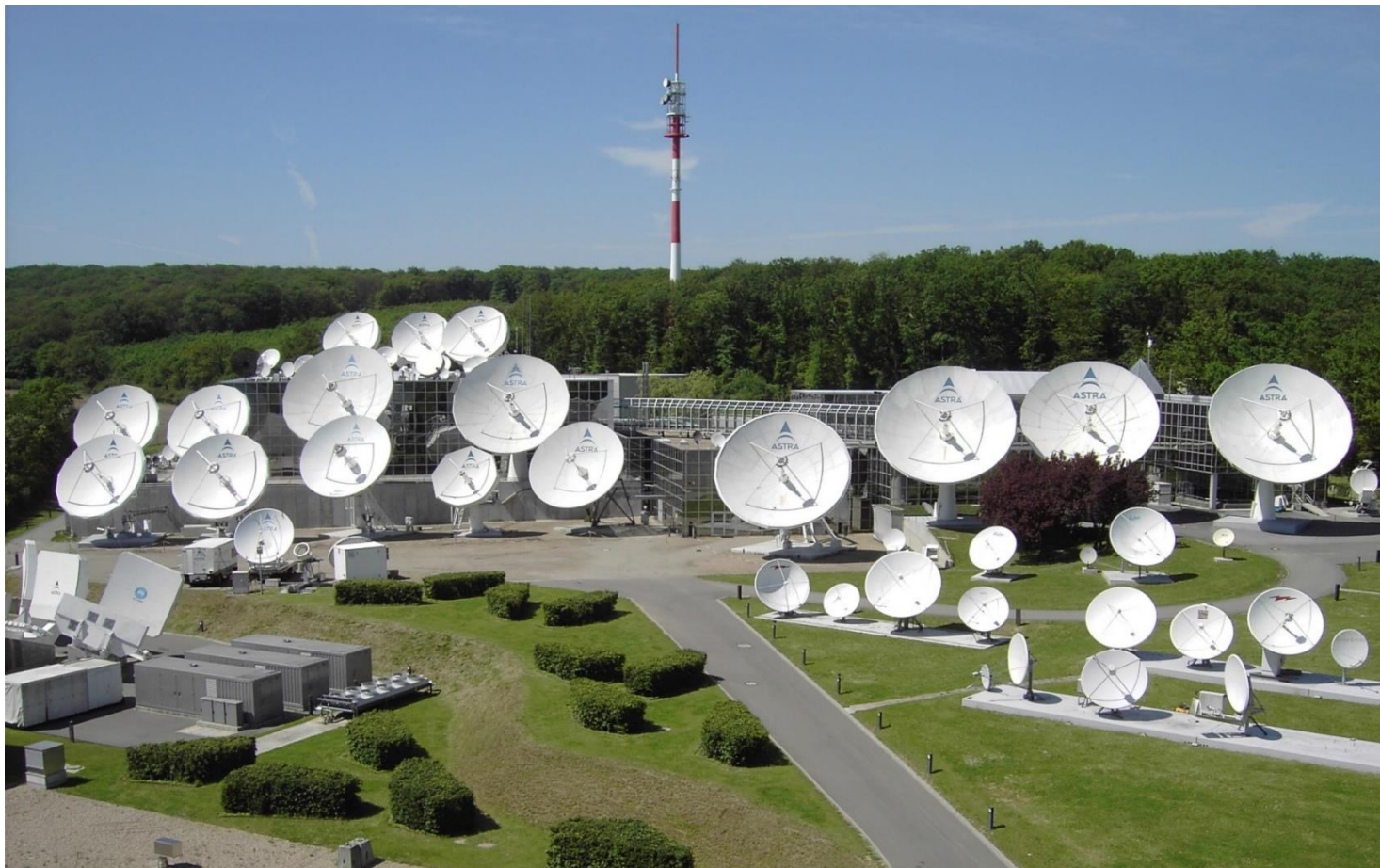


Betzdorf in the 80s



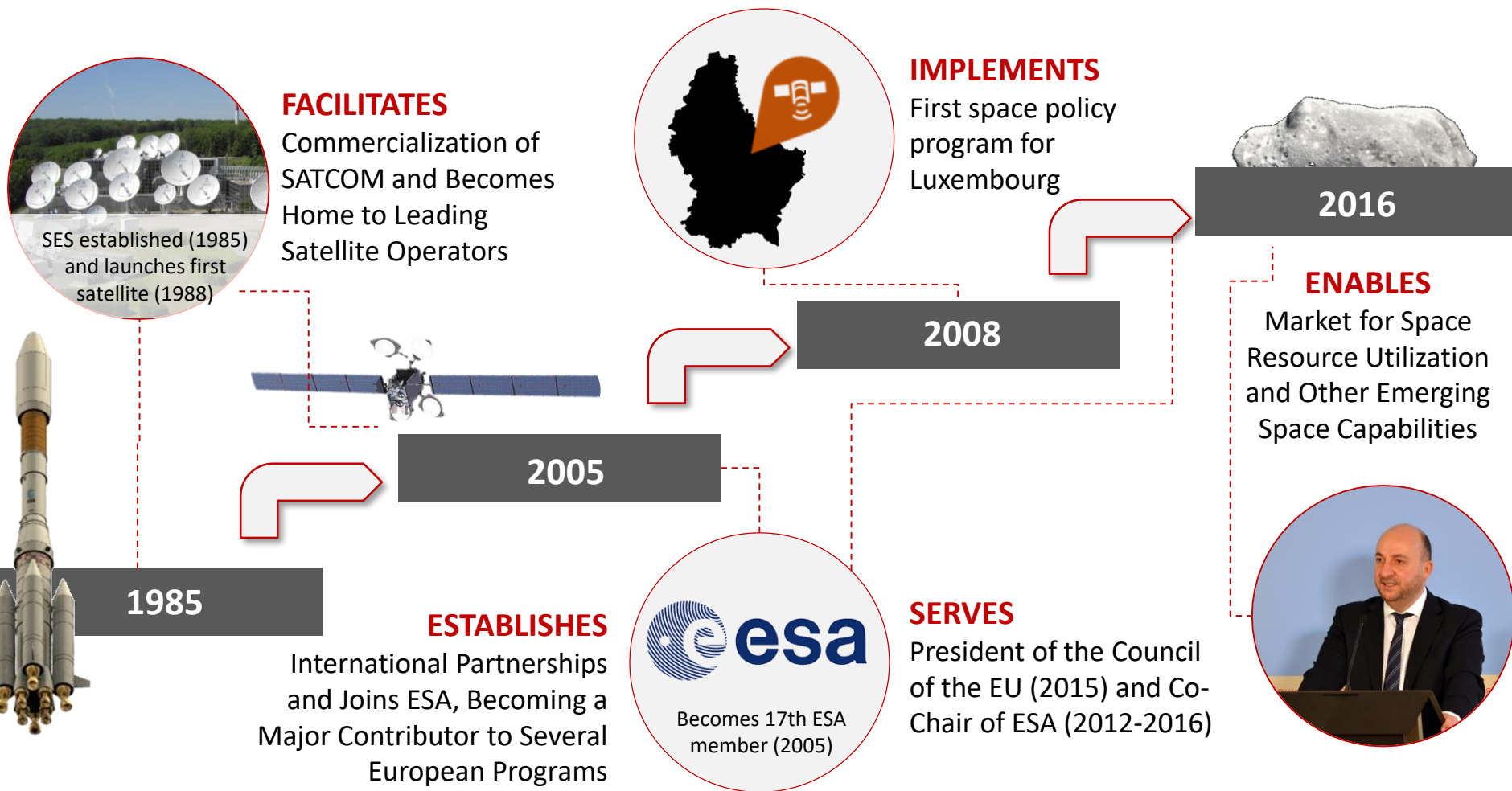


Betzdorf today





Luxembourg has been active in space for more than 30 years





Luxembourg Space Resources Initiative

3rd February 2016

www.spaceresources.lu



Cent quinze ans après Jules Verne, le Luxembourg se lance dans « la chasse au météore ». Contrairement au roman, il ne s'agit pas de s'intéresser à l'or d'un astéroïde qui s'écrase sur la Terre, mais d'envisager l'exploitation des richesses minérales dans l'espace.





Realizing the potential benefits of space resource utilization remains challenging and will require global engagement and partnership

Key Challenges



TECHNICAL

Capabilities necessary to prospect and utilize resources from space still must be developed, tested, and matured



REGULATORY

International & domestic legal frameworks need to be established to protect entrepreneurs, assure investors, and ensure responsible activities



FINANCIAL

Significant investment with long-time horizons must be available to enable private firms to develop and deploy critical systems



BUSINESS

Identification of capabilities needed for space mining with near-term business potential is required to ensure incremental growth as the market today is nascent



Luxembourg is implementing a comprehensive strategy to realize its space resources vision



Luxembourg aims to contribute to the peaceful exploration and sustainable utilization of space resources for the benefit of humankind

- - - Five Strategic Pillars - - -

- 1 Ensure national political **support** and **promote** international cooperation
- 2 Build clear **legal framework** and engage internationally
- 3 Promote long-term public support and workforce engagement through **education and R&D**
- 4 Provide dedicated support for industrial **research** and development activities
- 5 Develop **investment** instruments focussed on commercial space



Promoting space resource utilization internationally

International Advisory Board on Space Resources:



- ❑ Former ESA Director General
- ❑ Former Head of NASA Ames Research Center
- ❑ Former President of Korea Aerospace Research Institute
- ❑ Former DG of the National Space Science Center, China

International Engagement Vision:

Luxembourg is convinced that this endeavor is of particular significance for humankind; therefore, Luxembourg is engaging in partnerships with countries ready to contribute to the same goal

Current International Engagements

ESA and EU



Luxembourg continues its active engagement with the international community on the UN COPUOS



Bilateral agreements with Japan, Russia, China, UAE, and Portugal





Implementing a step-by-step approach to build a clear regulatory framework

STEP-BY-STEP APPROACH:

- **Establish** a national legal framework in accordance to international law;
- **Engage** on multilateral, bilateral and international levels on issues that require international coordination;
- **Participate** internationally to advance discussions on space resources activities and to develop an international framework



The Luxembourg Parliament adopted a law on the exploration and use of space resources. The **law** came into force on **August 1, 2017**



The **Hague Space Resources Working Group** drafted building blocks for an international framework concerning space resource activities



Luxembourg engaged with the international community on the **UN COPUOS** regarding in-space governance



Developing public research and educational programs through national and international partnerships

National and International Partnerships

- **National:** further develop space research capabilities at Luxembourg public research institutions



- **Europe & US:** Regular exchange with leading universities and research institutes
- **Japan:** Cooperation between **Tohoku** University and the University of Luxembourg
- **China:** Partner with **NSSC** to establish Research Laboratory of Deep Space Exploration in Luxembourg

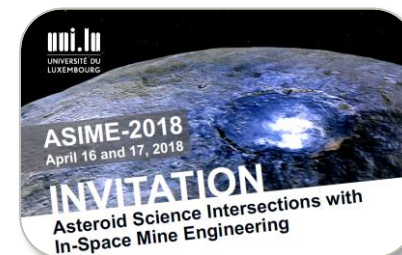
Academic Program Development

- **New Space Masters Program:** Teaching students with **technical backgrounds** tools of business along with specific technical expertise needed to support local industry.

TECHNICAL	COMPANY INTERNSHIP (6 months)
NON TECHNICAL	

← 2 YEARS →

**ASIME 2018
Workshop**





Enhancing public R&D efforts to support and enable the exploration and utilization of space resources

Research - Space Resources Research Center (SRRC)

Objective:

The objective of the research center is to **increase R&D capabilities** in Luxembourg required by the **local space** industry and position Luxembourg as a **center for space resources**

SRRC

SPACE ENGINEERING

SPACE RESOURCES



Enhancing public and private R&D efforts to support and enable the exploration and utilization of space resources

Activities on National-Level

- **LuxIMPULSE:** Space R&D program in the Ministry of the Economy, jointly implemented with ESA
- **Technoport:** National technology incubator supporting start-ups with activities in Luxembourg



SPACE EXPLORATION MASTERS

- Sponsor the SpaceResources.lu **Prize** in the Challenge of the Space Exploration Masters valued at up to EUR 500,000
- The submission phase started on May 1st and runs until the end of July

NEW SPACE EUROPE

First New Space conference in Europe

Last year, it attracted 450 entrepreneurs, engineers, government officials and investors from all around the world.



Etienne Schneider,
Deputy PM of
Luxembourg, and ESA
DG Jan Woerner

**sign agreement to
evaluate SRU missions**





FNR - Fond national de la recherche Funding of R&D projects



SPACE PEARL

- Attraction of a **leading researcher** to one of Luxembourg's public research institutions
- Develop a research programme in the strategic area of Space/Space resources with the potential to generate long-term impact.
- **High degree of freedom** to candidate to develop his research programme and group independently
- Full **long term** commitment by the institution

SPACE PPP

- **Public Private Partnerships** for Space-related research activities between public institutions and industry
- **Project funding** up to 400k€ for collaborative research projects
- Individual **PhD and Postdoctoral** grants for collaborative projects



Enabling access to capital for commercial space exploration companies through partnerships

Types of Financial Instruments Available

- **Grants:** for commercially oriented research and development
- **Prizes:** for innovative start-ups with strong business plans
- **Early-Stage Financing:** Equity investments through national investment bank
- **Growth-Stage Financing:** Equity investment for high-potential space companies
- **Debt Financing:** Specialty loans & other debt financing instruments for certain projects

Key Partnerships Established

- Cooperation agreement with the European Investment Bank (EIB)
- Luxembourg Future Fund (LFF) with European Investment Fund
- National investment bank on highly strategic investment opportunities



The Luxembourg Space Fund

- Luxembourg Government with a consortium of public and private entities formed a PPP
- The PPP envisions a fund to invest in early stage space ventures



Mining Space Summit

Friday, September 28th 2018



- **One-day workshop** for stakeholders from across the mining industry and the space industry, including government and financial institutions
- **Identify synergies and mutual interest** in potential common business models and in technology and operations **for future investments or collaborations**
- 100 participants, invitation only



LE GOUVERNEMENT
DU GRAND-DUCHÉ DE LUXEMBOURG
Ministère de l'Économie

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LET'S MAKE IT HAPPEN

