ESA Council at Ministerial level (Paris, 22-23 November 2022)

Presentation of the Programmes to the Belgian actors

Belgian Science Policy Office

Antwerp Expo
30 September 2022
Introduction

frank.monteny@belspo.be
Science and Exploration
- The Science Programme

werner.verschueren@belspo.be
Science and Exploration

- Human Spaceflight, Microgravity and Exploration

tom.verbeke@belspo.be
Applications
-
Earth Observation

steven.bogaerts@belspo.be
jan.verbesselt@belspo.be
Earth Observation Programmes
Proposed Belgian participations

Future EO:
✓ different kind of opportunities for BE players: Scientific & Industrial
✓ BE over-returned in previous periods
✓ BE strongly support to the programme

EarthWatch:
✓ ALTIUS Completion: operations, validation and scientific products
✓ Climate-Space: potential collaboration BE Climate Center, institutes & universities
✓ Digital Twin Earth (DTE): bringing together different disciplines, prepare BE-actors for DestinE
✓ InCubed+: implement commercial activities in a fast way with an engagement of ESA EO team

Copernicus Space Component 4 phase 2:
✓ Sentinel-1 NG, Sentinel-3 Topographic NG
✓ Return on investment (recurrent units by EC)

Aeolus-2:
✓ Development of an operational doppler wind Lidar mission
✓ Return on investment (recurrent units by EUMETSAT) (+ EUMETSAT contribution)
Applications

- Telecommunications and Integrated Applications

sophie.pireaux@belspo.be
ARTES 4.0 Programme

@CMIN22:
- Satellite constellation + digitalization
- Strong ARTES CC participation while being active in new Telecom programs related to EU
- New participation to 5G -> 6G
- Greener space & space4green
- New: ARTES 4.0 Hubs, vs Belgian interests in cybersecurity and 5-6G
ARTES 4.0
Generic Programmatic Lines (GPLs)

FP = Future Preparation (ARTES entry ticket)
for knowledge building, preparatory studies, standardisation
according to an ESA workplan

CC = Core Competitiveness
BE usual strong a la carte use

BASS = Space Solution Center XL (including Hubs)
& Business Applications
& Ambassadors, Investors

PP = Partner Projects
BE careful occasional use as sub
ARTES 4.0
Strategic Programmatic Lines (SPLs)

➢ **4S (Secure Systems for Safety and Security):**
Secure Satcom for key infrastructures or in support to crisis management, maritime safety, border control and other security domains; in agreement with policies/regulations/specifications under authority of institutional/public bodies

➢ **Scylight – Optical Comms *and Quantum:***
optical and QKD telecom technologies in space are expected to achieve major impacts on the satcom sector in the next decade (high transmission rates, data security and resilience)

➢ **5-6G and Green Space:**
new generation of telecom is key to support the Digital (Green) Transformation with integration of satellite with terrestrial telecom networks

BE FOCUS

BE NEW INTEREST
NEW Telecom Programmes for CMIN22

➢ **ESA Programme Related to EU Secure Connectivity:** ESA Memberstates will develop and validate elements to provide secured telecom (hard-gov, light-gov and commercial). ESA will be partnering with the EC and contribute directly to the EU Secure Connectivity Initiative.

➢ **Moonlight (Navigation and Telecoms for the Moon):** involves expanding satnav coverage and communication links to the Moon. The first stage involves demonstrating the use of current satnav signals around the Moon. This will be achieved with the Lunar Pathfinder satellite in 2024.

➢ **Civil Security from Space’ (CSS):** a federated solution interconnecting space and ground systems and services, existing, planned and future. The solution will include Earth observation systems, space-based positioning & navigation, enhanced telecommunication system and Internet of Things (IoT) resources.
Applications
-
Navigation

pierre.coquay@belspo.be
Enabling and Support
- Commercial

hendrik.verbeelen@belspo.be
Enabling and Support
- Technology

hendrik.verbeelen@belspo.be
peter.vangeloven@belspo.be
matthias.piens@belspo.be
Enabling and Support - Space Transportation

hendrik.verbeelen@belspo.be
matthias.piens@belspo.be
# Space Transportation Systems

@ ESA CMIN 22

## Pillar I. Ariane and Vega
- Ariane 6: 405 M€
- P120C+: 202 M€
- Vega: 505 M€
- Transition: 195 M€
- Exploitation: 493 M€
  - Ariane: 302 M€
  - Vega: 91 M€

## Pillar II. Future preparation
- Boost!: 140 M€
- FLPP: 668 M€
- Technology disruptors & space logistics: 116 M€
- Prometheus: 230 M€
- Themis reusability: 212 M€
- Reusable upper stage: 80 M€
- Human Space Transport: 30 M€

## Pillar III. Space Rider
- Completion & Services Improvements: 100 M€
- Evolution: 10 M€

## Pillar IV. Infrastructure
- CSG 2023-2027: 593 M€
- Reference MCO: 485 M€
- Flexible, digital, sustainable: 69 M€
- Core Launch Range Renewal (CLRR): 39 M€

**Total**
- Pillar I: 1700 M€
- Pillar II: 828 M€
- Pillar III: 110 M€
- Pillar IV: 593 M€
- Total: 3331 M€
Space Transportation Systems

@ ESA CMIN 22

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**Total**: 1700 M€ (Ariane and Vega) + 828 M€ (Future preparation) + 110 M€ (Space Rider) + 593 M€ (Infrastructure) = **1721 M€**
Space Transportation Systems
@ ESA CMIN 22

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Space Safety and Security

- Space Safety

werner.verschueren@belspo.be
Space Safety Programme (S2P)

Proposed Belgian participations
(in red: participation if constant overall space budget)

COSMIC:
✓ **SWE Core**: Service Network and Data Centre continuation and evolution, modelling, Proba-2, Proba-1, hosted payloads (*strongly decreased*)
✓ **AURORA small mission**: mission prime, instrument components (--) 
✓ **NANOSAT mission**: subcomponents (--) 
✓ **NEO Survey System**: elements (--) 
✓ **APOPISIS study**: study lead -> mission prime in CMin2025 (idem) 
✓ **DRACO mission**: re-entry capsule (idem) 

VIGIL phase 2:
✓ Spacecraft and/or instrument components (main instrument contribution in PRODEX) (--) 

HERA phase 2:
✓ Mandatory participation to finalisation of ongoing activities, launch, operations (idem) 

ADRIOS phase 2:
✓ No subscription (idem)
Other
-
Education

tom.verbeke@belspo.be
julien.beclard@belspo.be
EU

Nationally co-funded projects
Waiver for participation to EU space activities

david.cox@belspo.be
jean-françois.mayence@belspo.be
Bilateral

pierre.coquay@belspo.be
National Terrascope and Stereo

joost.vandenabeele@belspo.be
jean-christophe.schyns@belspo.be
TERRASCOPE

– Manages Belgian RS heritage data
– Belgium’s *collaborative ground segment* since 2017

• complementary access to Sentinel data and/or to specific data products or distribution channels
• funded by third parties
• enhance and facilitate the Sentinel missions’ exploitation

- Data acquisition and production
- Complementary products and algorithms definitions
- Specific tailoring for regional coverage or specific applications
- Data dissemination and access
- Development of innovative tools and applications
- Support to cal/val
TERRASCOPE DATA & PRODUCTS

**Sentinel-1**
- Benelux area
  - Full archive
    - GRD
    - Coherence

**Sentinel-2**
- Europe/selected regions
  - Full archive for Benelux
  - 2Y rolling archive for EU
    - L2A TOC
    - Vegetation indices
    - Water indices

**Sentinel-3**
- Global
  - Full archive
    - SYN-VGT
      - To be released
    - Vegetation indices
    - Water indices

**Sentinel-5p**
- Global
  - 2018 - present
    - NO2
    - CO

**PROBA-V**
- Global
  - Full archive
    - L1C
    - L2A
    - L3 products

**SPOT VEGETATION**
- Global
  - Full archive
    - P products
    - Level 3 products

**Global Land Service**
- Global
  - Full archive
    - LAI
    - FAPAR

**Copernicus DEM**
- Global
  - 30 m
  - 90 m

**ESA WorldCover**
- Global
TERRASCOPE SERVICES & USERS

- **Terraviewer**
  - Novice users
  - Viewing
  - Comparing
  - Time lapses
  - Downloads
  - Time series analysis

- **Virtual Machines**
  - Expert users
  - NFS File access
  - Wide Open source toolset
  - Access to HPC

- **Jupyter Notebooks**
  - Expert users
  - Use Python/R/Scala
  - Access to HPC

- **Web Services**
  - Expert users
  - WMT/WMTS
  - OpenSearch Catalogue

- **OpenEO API**
  - Expert users
  - Platform independent
  - Datacube technology
  - Processing capabilities
  - Custom scripting on R/Python/JS
  - Connection to other back-ends

- **Open for everyone**: scientists, public authority, industry, citizens – expert and lay users
- **Free to use for everyone**
- **8000 + registered users**
TERRASCOPE NEXT PHASE

Duration: 2023 - 2028

Tasks:

• Maintenance and operation of the platform
• Addition of additional datasets
• Provide Proof-of-Concepts for specific use cases
• Make bi-directional use of federated European networks of data portals and DIAS (Data and Information Access Service) cloud environment to complement data and service offering
• Support of Belgian institutional 3rd parties to develop a service onboarding
• Provide support to the Belgian Climate Center and lay the groundwork for a Belgian role in Europe’s future Green Information Factories initiative and DestinE programme
• Increase stakeholders and intensify stakeholder interaction
• Roll out of EOPlaza
EOPLAZA

A platform for delivery of on-demand EO services

- Valorization of prototype algorithms/project outcomes on EO data
- Exposure to full Terrascope user base, including international network
- Allowing (Belgian) players to expose their knowledge/services
- Supported by federated Terrascope datasets and orchestrators
- Supported by EO and IT expertise

A parametrized processing block containing an algorithm
Based on EO & ancillary data
Operational through state-of-the-art orchestrators
Adds value -
Produces an output -
An image or a vector file
STereo IV

- **STereo IV**: Support to exploitation and research in EO
  - Duration: **2022-2029**
  - Budget: **28,15 M€** - First call for proposals 2022
  - Objective: Building of topnotch, dynamic and visible RS community

**Stereo projects:**
Highly varied and flexible in terms of:
- Type
- Duration and budget

**Eligible for project funding:**
- universities, public and non-profit research institutions

**Thematic priorities:**
- Impact of climate change on terrestrial/marine environments
- Advanced Monitoring and Assessment of Hazards
- Environmental health and biodiversity
- Sustainable and Green Cities

**Methodological priorities:**
- AI and deep learning
- Big data exploitation
- Use of multimission and multi-scale data

[https://eo.belspo.be](https://eo.belspo.be)
Scientific Support
- PRODEX and Scientific Data Exploitation

werner.verschueren@belspo.be
**PROgramme for the Development of scientific EXperiments**

- Provide funds through ESA for **payload:**
  - ✓ hardware and software development
  - ✓ science operations
  - ✓ data exploitation

- Cooperation among **scientific institutes/universities** and between those (in the driving seat) and **industry**

- **Implementation:**
  - ✓ ESA selects the projects
  - ✓ BELSPO determines the level of financial support
  - ✓ ESA issues the contracts with institutes and industry
  - ✓ Joint follow-up by ESA and BELSPO

- Guaranteed **georeturn** of one
5 Fields of Research:

- Space Sciences (~ Science Programme)
- Life and Physical Sciences (~ ISS Programmes)
- Earth Observation (~ EO Programmes)
- Space Exploration (~ Robotic Exploration Programmes)
- Space Safety (~ Space Safety Programme)

Belgian Guidelines for the PRODEX Programme
Templates for project submission

http://www.belspo.be/belspo/space/esa_prodex_en.stm
Belgian subscription for 2024-2026

If constant space budget:
  → decrease of PRODEX with respect to CMin 2019
  → further saving on data exploitation and on non-ESA missions

If proposed increase of space budget:
  → Increase in Prodex for a stronger Belgian participation to payloads
  → Transfer data exploitation from PRODEX to:
    for EO (atmosphere): add to STEREO + special effort in relation to the Centre of Excellence for Climate
    for SS, Expl, ESO: new national programme ‘Scientific Data Exploitation’
ESEC

@

national R&I system

pierre.coquay@belspo.be
Wrap up

pierre.coquay@belspo.be
THANK YOU
The Space Department of BELSPO

Julien BECLARD
Steven BOGAERTS
Jan VERBESSELT
Danielle COOSEMANS
Pierre COQUAY
David COX
Pascal DERMINNE
Isabelle MEREAU
Matthias PIENS

Sophie PIREAUX
Pieter ROTTIERS
Jean-Christophe SCHYNS
Martine STELANDRE
Peter VAN GELOVEN
Joost VANDENABEELE
Hendrik VERBEELEN
Tom VERBEKE
Werner VERSCHUEREN

+ Frank MONTENY, Alain HEYNEN and Jean-François MAYENCE