Portuguese Activities in Space

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Outline

1. Portugal in Space
2. Portugal in ESA
3. Participation of Industry and Academy
4. Major National Missions in ESA
5. Return to Portugal through FP6 e FP7 Space
6. Facilities

Further information at the FCT Space Office* Web:

www.fct.pt/apoios/cooptrans/espaco/index.phtml.en

*Special thanks
1. Portugal in Space - Milestones

- 1993: Launch PoSAT-1
- 1996: PT Cooperating State ESA
- 1997: White Paper on Space
- 1999: PT Member State ESA
- 2000: Task Force
- 2001: EC-ESA Fw Agreement
- 2003: GPE@GRICES
- 2007: Lisbon Treaty
- 2009: European Space Policy
- 2010: FCTSO
- PT subscribes ARTES and GNSS (incl. Galileo)
- ESO co-operation agreement
- ESO full member

Source: ESA e FCT Space Office
1. Portugal in Space

- First Portuguese satellite
- Ariane 4
- 5M€ (2M€ Consortium of companies and national universities: EFACEC, INETI, IST, Alcatel, …; 3M€ PEDIP)
- Until 2006 used in UN peacekeeping operations and data transfer between military

Source: ESA e FCT Space Office
2. Portugal in ESA

ESA Budget (2010)

~ 3700 M€

| Income from Member States and Canada | 2778.6 M€ (74.2%) |
| Income from EU | 754.8 M€ (20.2%) |
| Income from ESA | 5.2 M€ (0.1%) |
| Other income | 206.1 M€ (5.5%) |
| **Total** | **3744.7 M€ (100%)** |

World Government Expenditures for Civil Space Programs in 2006

**Total:** US$ 27.83 billion

- USA 17,342
- Others 650

<table>
<thead>
<tr>
<th>Country</th>
<th>Expenditure</th>
</tr>
</thead>
<tbody>
<tr>
<td>USA</td>
<td>17,342</td>
</tr>
<tr>
<td>Canada</td>
<td>325</td>
</tr>
<tr>
<td>France</td>
<td>1,600</td>
</tr>
<tr>
<td>Germany</td>
<td>1,544</td>
</tr>
<tr>
<td>Italy</td>
<td>959</td>
</tr>
<tr>
<td>UK</td>
<td>378</td>
</tr>
<tr>
<td>Japan</td>
<td>2,231</td>
</tr>
<tr>
<td>India</td>
<td>813</td>
</tr>
<tr>
<td>Portugal</td>
<td>15</td>
</tr>
<tr>
<td>Israel</td>
<td>1</td>
</tr>
</tbody>
</table>

ESA is our Space Agency

Source: ESA
## 2. Portugal in ESA

<table>
<thead>
<tr>
<th>Country</th>
<th>Mandatory Activities</th>
<th>Optional Programmes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Austria</td>
<td>2.09%</td>
<td>1.69%</td>
</tr>
<tr>
<td>Belgium</td>
<td>2.88%</td>
<td>6.62%</td>
</tr>
<tr>
<td>Czech Republic</td>
<td>0.81%</td>
<td>0.21%</td>
</tr>
<tr>
<td>Denmark</td>
<td>1.65%</td>
<td>0.93%</td>
</tr>
<tr>
<td>Finland</td>
<td>1.32%</td>
<td>0.45%</td>
</tr>
<tr>
<td>France</td>
<td>17.64%</td>
<td>26.39%</td>
</tr>
<tr>
<td>Germany</td>
<td>20.17%</td>
<td>23.31%</td>
</tr>
<tr>
<td>Greece</td>
<td>1.74%</td>
<td>0.18%</td>
</tr>
<tr>
<td>Ireland</td>
<td>1.16%</td>
<td>0.32%</td>
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<tr>
<td>Italy</td>
<td>12.11%</td>
<td>14.18%</td>
</tr>
<tr>
<td>Luxembourg</td>
<td>0.22%</td>
<td>0.44%</td>
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<tr>
<td>Netherlands</td>
<td>4.48%</td>
<td>3.00%</td>
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<tr>
<td>Norway</td>
<td>2.14%</td>
<td>2.13%</td>
</tr>
<tr>
<td>Portugal</td>
<td>1.16%</td>
<td>0.50%</td>
</tr>
<tr>
<td>Spain</td>
<td>7.69%</td>
<td>6.66%</td>
</tr>
<tr>
<td>Sweden</td>
<td>2.55%</td>
<td>2.07%</td>
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<tr>
<td>Switzerland</td>
<td>3.18%</td>
<td>3.24%</td>
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<tr>
<td>United Kingdom</td>
<td>16.26%</td>
<td>6.58%</td>
</tr>
<tr>
<td><strong>Total Member States</strong></td>
<td><strong>99.24%</strong></td>
<td><strong>98.91%</strong></td>
</tr>
</tbody>
</table>

*Source: ESA ANNUAL REPORT 2010*

The amount runs roughly corresponds to a 100% return to Portugal.

Source: ESA e FCT Space Office

Private sector participation in ESA represents about 90% of the total national participation.

Source: ESA e FCT Space Office

- SMOS
  - CSW
  - DEIMOS
- CRYOSAT-2
  - CSW
- SWARM
  - CSW
- MERIS/ENVISAT
  - UNL
  - IMAR
  - SAGREMARISCO
- GMES
  - UNITELCO
  - IMAR
  - IGP
  - IST
  - LUSOSPACE
  - YDREAMS
  - EDISOFT
  - GMVIS
  - ALTIOR
  - DEIMOS
  - CSW

Source: ESA e FCT Space Office

**Legend**
- **Industry**
- **Academy**
- **Entities with occasional participation**

**Source:** ESA e FCT Space Office

Navigation

Galileo
- GMVIS
- DEIMOS
- SPIN.WORKS
- SPACE SERVICES
- TELEMON
- CSW
- EDISOFT
- INDRA

GNSS Support
- INOV
- CAP GEMINI
- INESC
- SADCI
- EDISOFT
- COMPUQUALI

Legend
- Industry
- Academy
- Entities with occasional participation

Source: ESA e FCT Space Office

Scientific

Herschel Planck

Bepi Colombo Solar Orbiter

GAIA

Legend

- Industry
- Academy
- Entities with occasional participation

Source: ESA e FCT Space Office

Source: ESA e FCT Space Office
5. Return to Portugal through FP6 and FP7

| Source: Gabinete de Promoção do 7º Programa Quadro | Portuguese Activities in Space - Vienna, February 13, 2012 - 49th STSC Session |
6. Facilities

- European Southern Observatory
- GEM Radiotelescope 408 MHz - 10 GHz (Pampilhosa da Serra): Important for PLANK
- Square Kilometer Array – SKA: receiver prototype tests (Moura)
- ESA Tracking Station (Sta Maria, Azores): Ariane 5

Source: ESA e FCT Space Office

- On-going collaboration with Mozambique for telescope for measuring variations of the Earth’s albedo (thus energy balance) by observing the Earth shine on the moon.