ITALY IN SPACE

Andrea Lorenzoni
Ljubljana - February 3, 2010
Italy in Space

- Italy has been making important investments in space since 1960s
- Italy has been a member of the European space organizations since 1964: ELDO (for launcher construction) and ESRO (for the development of scientific satellites)
- Italy was one of the founding countries of the European Space Agency (1975) and now it is the third contributor to ESA
Italy in Space

- Italy was the first European country, the third in the world, to launch satellites (1964) and a national telecommunication satellite SIRIO (1977).
Established in 1988, ASI is a Governmental Agency, supervised by the Ministry of Education, University and Research (MIUR).

ASI strictly operates in coordination with the Interministerial Group responsible for Governmental guidelines in aerospace.

ASI defines the national strategies within the preparation of the national space plan which is approved by the Government.
ASI Mission

Promotion, development and diffusion of Scientific and Technological Research in the fields of space and aerospace

Coordination and management of national projects, including the participation to the European and International projects (ESA, EU, etc)

Elaboration and implementation of the Aerospace National Plan to be approved by the Governmental Authorities

Promotion of the integration of public and private subjects to fund national and international research activities
Field of main activities

- Observation of the Universe and Exploration
- Earth Observation
- Telecommunications and Navigation
- Microgravity
- Education
ASI Management

✓ President
✓ Board of Directors
✓ Technical-Scientifical Board
✓ General Auditor Board
ASI National Centres

Roma
ASI HQs

Trapani
Stratospheric Balloon Launches

Matera
. E.O.
. Space Geodesy
. Robotics

MALINDI-Kenya
. Launch base
. TC/TM & tracking services
Matera Laser Ranging
Very Long Baseline Interferometry (VLBI) System

• Deformation of Earth crust
• Star reference system
• Earth reference system
• Earth rotation
• Geopotential
• Precision Orbitography
• Atmospheric sounding
• Fundamental Physics
Stratospheric Balloons Launch Base - Trapani

Launch campaign of scientific experiments
S. Marco Space Centre Malindi (Kenya)
Intergovernmental Cooperation between Italy and Kenya
Sea Segment

- Santa Rita 1 & 2
- San Marco
Land Segment

Motorboat Harbour

ASI Station

Geophys. Activities

Education & Training

Tracking

Earth Observation
Data acquisition
Meteo and Remote Sensing
ASI Heritage (1/2)

**Scientific programs (satellites)**

**San Marco-1**
First Italian microsatellite launched in 1964

**LAGEOS II (Laser Geodynamic Satellite)**
Spherical massive laser-ranged satellite, embedded with retro-reflectors for geodesy and geodynamic studies. Launched in 1992

**SIR-C/X-SAR**
Space borne Imaging Radar-C/X-band Synthetic Aperture Radar, onboard the space shuttle. Launched in 1994

**TETHERED SATELLITE SYSTEM (TSS)**
Jointly developed with NASA, the satellite was linked to the Space Shuttle by means of a conductive tether. The interaction with the ionosphere revealed the possibility of electric production. First launch in 1992, second launch in 1996

**BEPPOSAX**
Scientific satellite for X-Ray astronomy. It gave an important solution to the origins of the gamma-ray burst, through the emission of the X-rays. Launched in 1996

**Telecommunication programs (satellites)**

**ITALSAT 1 – 2** Italian satellites with sophisticated technologies on board for telecommunication and television broadcasting. 1991, 1996
ASI Heritage (2/2)

**Scientific programs (payloads)**


**CASSINI/HUYGENS** Interplanetary mission developed with NASA and ESA for the studies of Saturn and, in particular, its moon, Titan. Launched in 1997.

**MARS EXPRESS** ASI participation to ESA Program with the development of the radar MARSIS and the driller for the lander. Launched in 2003

**ROSETTA** ESA mission for the rendezvous with the Comet Churiyumov – Gerasimenko. Launched in 2004

**SWIFT** ASI participation to the NASA mission Swift, devoted to the detection of the gamma-ray bursts. ASI contributed with the XRT X-ray mirror and with Malindi ground station. Launched in 2004

**MRO** (Mars Reconnaissance Orbiter) Sharad on board MRO, is an Italian facility instrument (Radar) launched on August, 2005
Italian contribution to ISS

Node 2

Columbus

MPLM Leonardo

Cupola

MPLM Raffaello

MPLM Donatello
National Plan: Strategic outlines

Average annual budget: 623 M€

Expenditures policy:

• National programmes

• Balanced ESA/national policy

• Bilateral programmes
NATIONAL AEROSPACE PLAN 2008-2010

Financial Statements Funding

- Fundings from active contracts: 0.86%
- Other National Fundings: 1.21%
- Fundings from other conventions: 0.51%
- Other Fundings: 4.68%
- Ministry of Education, University and Research: 92.66%
Strategic outlines

National commitments 2008-2010

- Human Life in space: 6%
- Medicine and Biotechnology: 6%
- Earth Observation: 29%
- Observation of the Universe: 47%
- Telecommunications: 6%
- Space Transportation: 6%
- New technologies and technological transfer: 4%
Budget ESA 2008

- General Budget: 21.46%
- Budgets related to the GB: 13.31%
- Scientific Programs: 13.09%
- Earth Observation: 8.87%
- Telecommunications: 6.06%
- Navigation: 4.01%
- Microgravity: 1.51%
- Human Life in Space: 1.51%
- Launchers: 0.11%
- Technology: 1.51%
- Third Party: 2.32%
- Cooperating Nations with ESA: 11.45%
On going Scientific Projects:

**Swift (2004)**
- the XRT X-ray mirror
- the ASI Malindi ground station
- XRT data reduction and analysis software

**Dawn (2006)**
- mapping Spectrometer

**GLAST (2006)**
- contribution to Large Area Telescope (LAT)

**Cassini (1997)**
- Multiple Frequency High-gain Antenna
- RF System for Radio Science Subsystem (RFIS)
- Radar RF Experiment (RFES)
- Visual Infrared Mapping Spectrometer (VIMS)
- Huygens Atmospheric Structure Instrument (HASI)
On going Scientific Projects:

Bepi Colombo (2012)  –  ESA mission
Italy-USA collaboration for Mercury Orbiter Radio Experiment (MORE)

Sharad on board MRO (Launched in 2005)

AGILE
Detection of Gamma Ray sources (Launched in 2007)
ROSETTA – ESA mission, Italy involved in the lander managment and responsible for the driller (SD2) and for the GIADA and VIRTIS instruments

VENUS EXPRESS – ESA mission, two Italian instruments onboard: Planetary Fourier Spectrometer and Visible and Infrared Thermal Imaging Spectrometer

MEX – ESA mission, ASI-NASA bilateral collaboration in MARSIS, Italy responsible for PFS + other participation

Capabilities gained through the development of national and european programs like EUROPA, Mole, DeeDri-IPSE, SPIDER (autonomous free-flyers)
Earth Observation applications

Geo Hazard

Applications
Civil Protection from Lanslides, Floods, Fires, Oil Spill

- Seismic Risk
- Volcanic Risk
- Air Quality

Preliminary Projects

Feasibility Studies
National & International Missions

- COSMO SkyMed
- Bistatic Interferometry
- Small optical satellite

- SIASGE (ASI-CONAE)
- ORFEO (ASI-CNES)
- SAC-D Aquarius (Radio occultation ROSA)
- OCEANSAT-2 (ASI-ISRO)

- ERS/ENVISAT
- EARTH EXPLORERS Program
- EGPM
- GMES “Sentinels”
COSMO-SkyMed is a Remote Sensing dual System Constellation of 4 Satellites in X band. The system is funded by the Italian Space Agency with the contribution of the Ministry of Defence. The Satellites will take SAR images of the Earth in the X-band for Civil Institutional, Defence/Intelligence, Commercial and Scientific Users, providing data with unprecedented quality (resolution and accuracy).
Launchers

• **VEGA**
  - Italian leadership in the ESA development program
  - 1500 kg @ 700 km circular polar orbit from CSG European Spaceport
  - Simple and reliable design

• **ARIANE**
  - Support to ESA activities

• **LYRA** launcher under study, derived from Vega

Future Launchers

Technologies
Telecommunications and Navigation

- Athena–Fidus (TLC Ka-band dual institutional infrastructure) in cooperation with France

- Payload and on board technologies (Q/V and W band, atomic clocks...)

- Applications and prototype services
Prevent or solve health problems related to long-duration space travel

Bring discoveries and products of clinical benefit to Mankind on the Earth
Education

• Space Courses and Masters at University and Education Institutions
• Fellowships
• Training and stages
• International and bilateral education projects (Africa, Argentina)
• Summer Schools
International Cooperation framework

• Italy promotes cooperation activities in Europe as a member state of ESA and European Union

• Italy cooperates in G8 context in order to promote the space activities and applications (environment, climate change, Africa)

• Italy promotes bilateral and multilateral space relations and cooperation with space countries
Current Bilateral Agreement Cooperation

- European countries, USA, Russia
- Argentina, Canada, China, Japan, Kenya, Brazil, Israel
ASI-NASA MoU for ISS

0.85% of NASA ISS utilization
+ 3 short duration astronaut flights
+ 3 long duration astronaut flights

3 MPLM Modules
The Italian astronauts

Franco Malerba

Umberto Guidoni

Maurizio Cheli

Roberto Vittori

Paolo Nespoli
…..and the future

Samantha Cristoforetti

Luca Parmitano
Italy and Space Exploration

The Global Exploration Strategy
A Framework for Coordination

May 2007
THANK YOU FOR THE ATTENTION AND CONGRATULATION TO SLOVENJIA FOR THIS IMPORTANT STEP OF SPACE NATIONAL HISTORY