Bulgarian activities and main stakeholders in space related R&D, industry and business

August 2014

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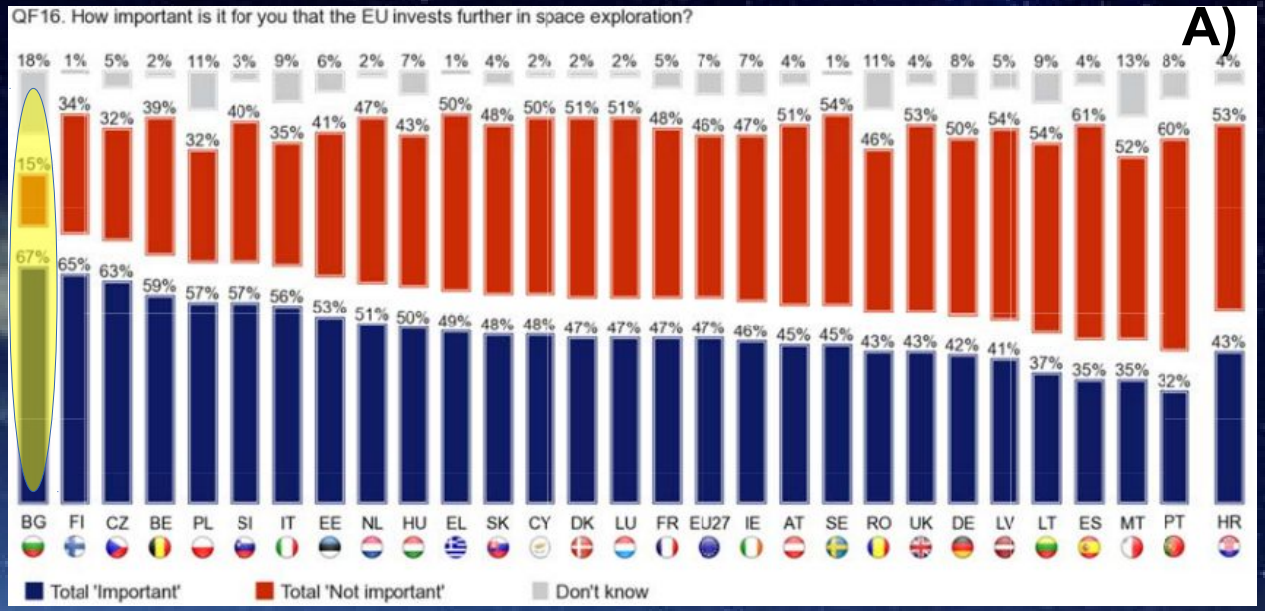
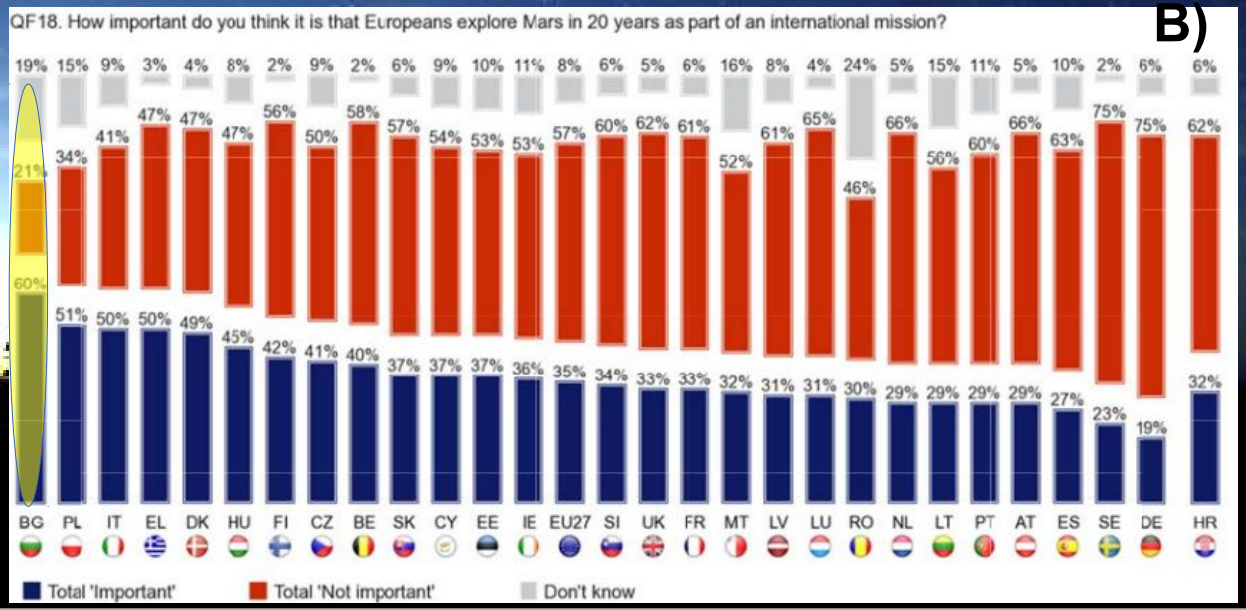
OUTLINE

- Government coordinating bodies and interactions
- Academic organizations
- SMEs' and Industry
- Government structures
- Achievements and current activities
- Conclusions

Bulgarian Public Support for Space



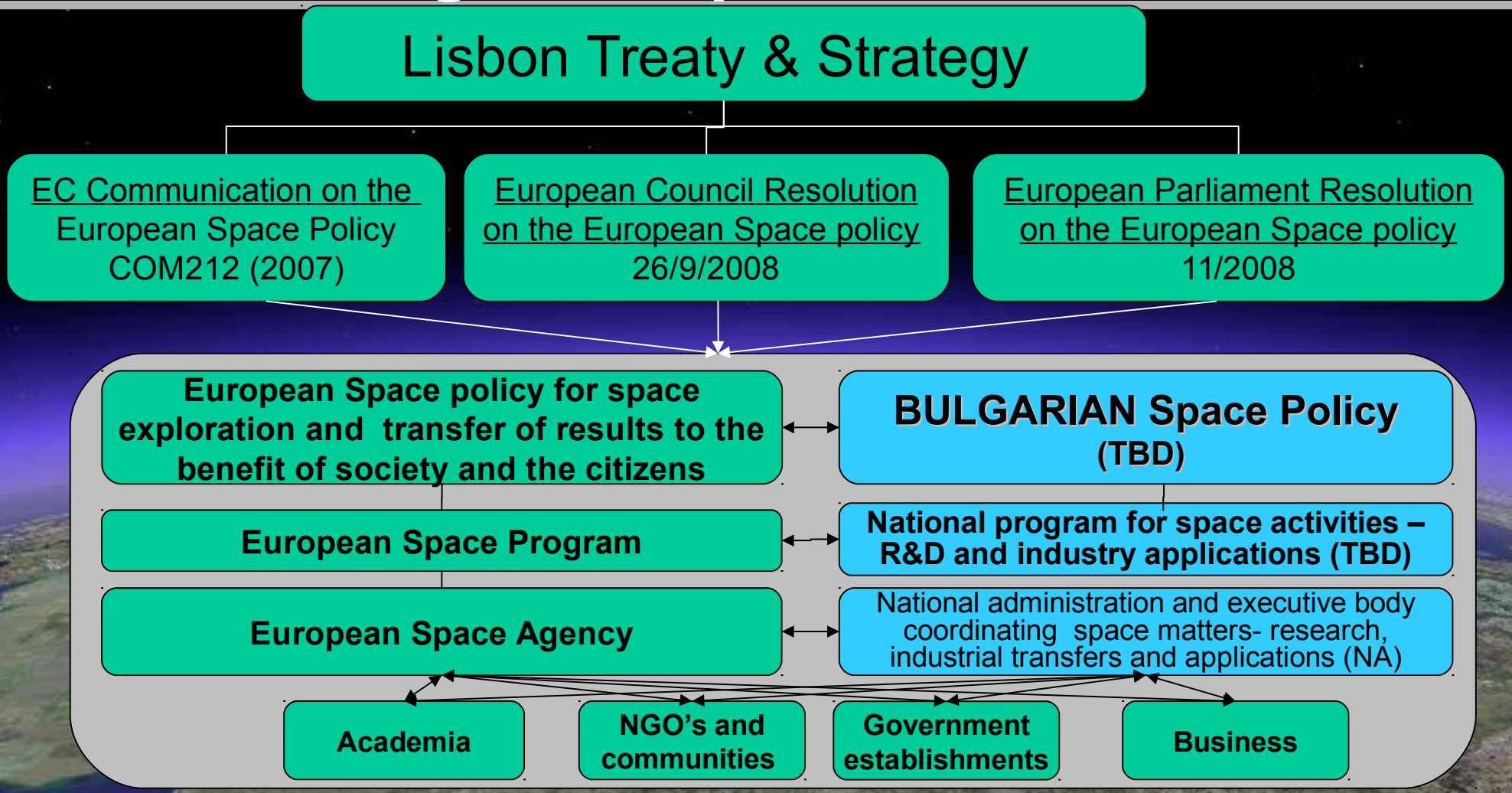
The public opinion in Bulgaria supports the most the increase of the EU investments for space exploration
(see chart A)



The public opinion in Bulgaria supports the most long-term large scale space programs e.g. mission to Mars
(*see chart B*)

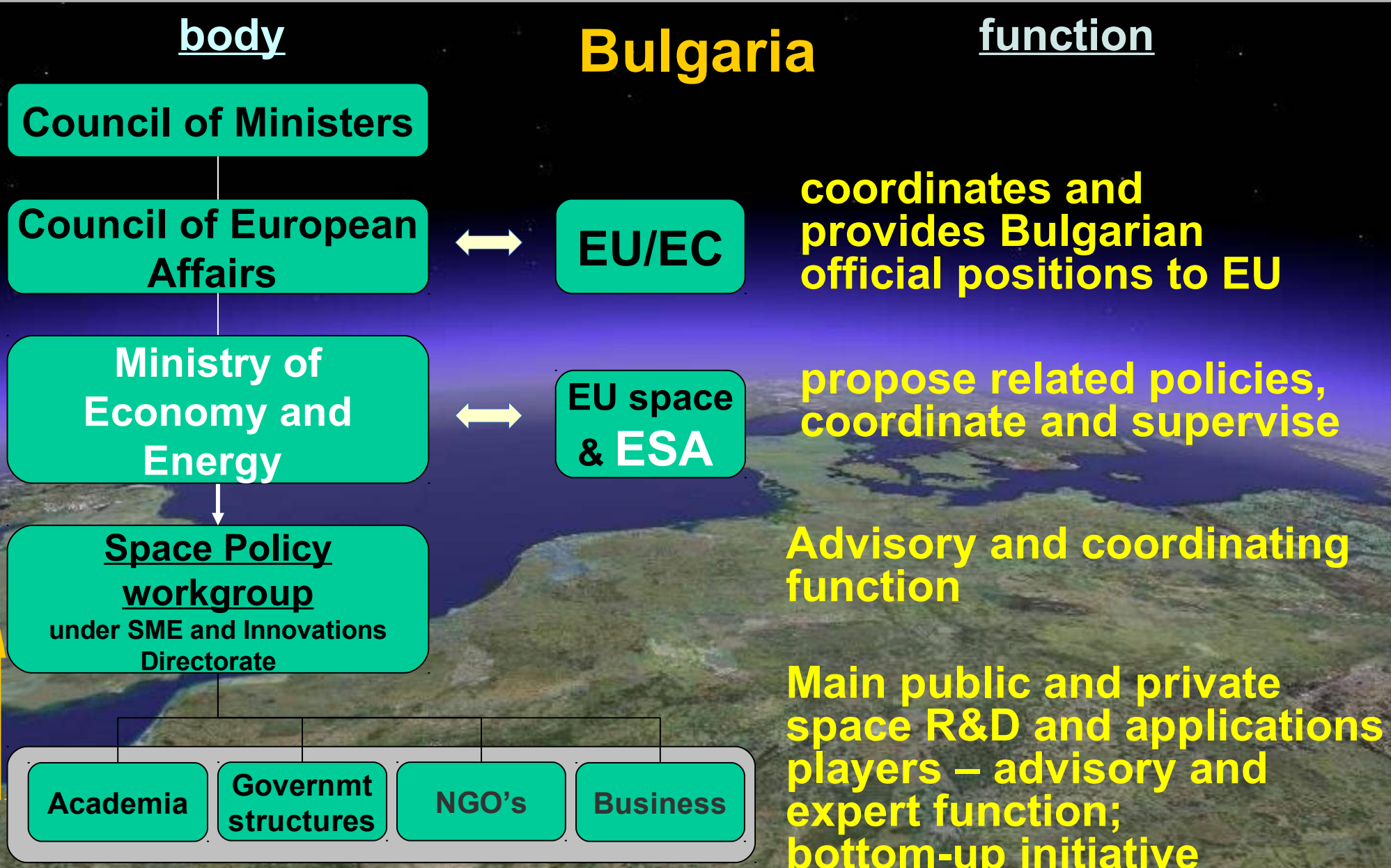
EU survey analysis
('Eurobarometer', 2013)

Bulgarian space activities and EU



The Successful integration of Bulgaria in the EU implies Bulgarian participation in the definition of the EU space policy and the EU executive bodies related to fulfillment of the Lisbon Treaty concerning space exploration and related goals

Bulgaria's space matters coordination mechanism



Main EU space Regulations adopted in 2012-2014

1. Regulation (EU) 377/2014 of the European Parliament and of the Council on establishing the COPERNICUS program and repealing the Regulation (EU) 911/2010;

2. Regulation of the European Parliament and of the Council on implementation ans exploitation of the European satellite navigation systems GALILEO

3. Regulation (EU) 1285/2013 of the European Parliament and of the Council on amending Regulation (EU) 912/2010 setting up the European GNSS Agency

4. Decision of the EP on establishing the Space Surveillance and Tracking Program

Bulgarian input actively coordinated through the Space Policy work-group of the SME and Innovations Directorate, Ministry of Economy

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Academic organizations

- Sofia University
- Technical University - Sofia
- *Bulgarian Academy of Sciences*
- Technical University - Plovdiv
- Bulgarian Agricultural Academy
- Mining and Geology University
- MOD Academic structures
- other regional ……

Broad range of fundamental and applied sciences R&D institutions

- Engineering - EE, electronics mechanical, Software, etc
- Remote sensing applications studies
- Space physics and other
- Aerospace engineering, other
- Remote sensing applications
- Air flight engineering and other

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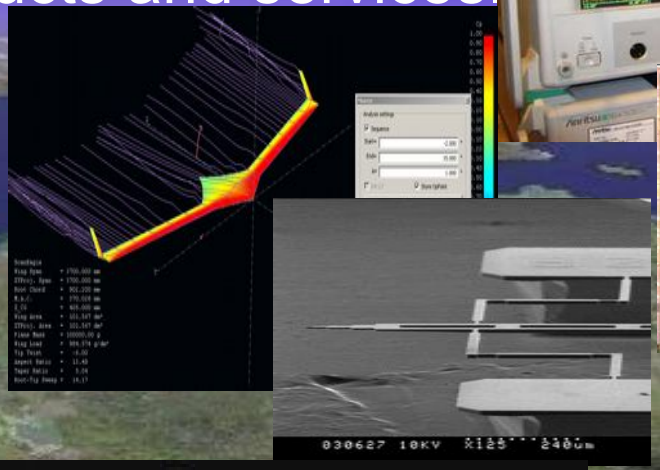
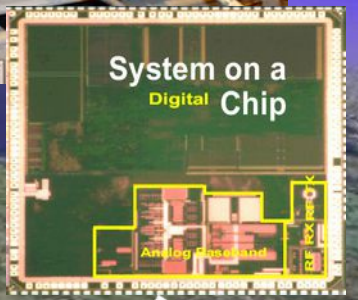
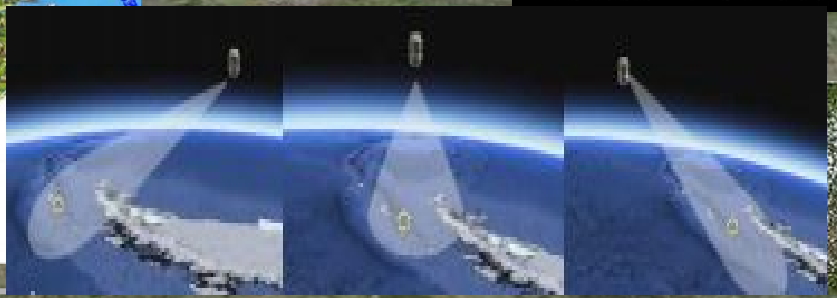
SMEs' and Industry- Clustering Approach

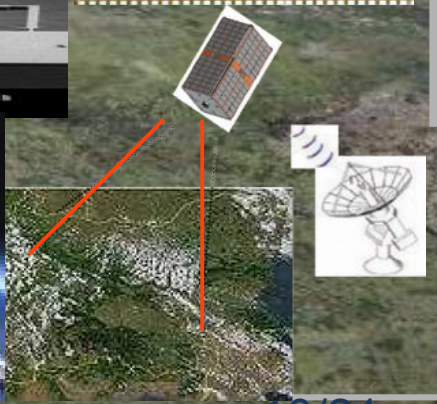
CASTRA

Industrial cluster with members such as SME's, business organizations, academic institutions and non-government organizations with activities and capacity to develop aero-space technologies and their application in innovative products and services.









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Other government structures with space activities

Ministry of Foreign Affairs

UN space matters coordination

Center for Aero-Space monitoring
Directorate for Natural disaster prevention and Crisis Response at the Ministry of Interior

Real time space imagery observation, evaluation and decision making analysis of natural and anthropogenic phenomena within the national territory

Ministry of Transport, Information technology and Communications Spatial Databases Department

Supports building capacity related to GALILEO and COPERNICUS

Ministry of Education and Science
(Fp7, Horizon 2020 funding) &
National Science Fund and National Innovations Fund
(national R&D funding budgets)

National R&D projects funding , including space science and engineering

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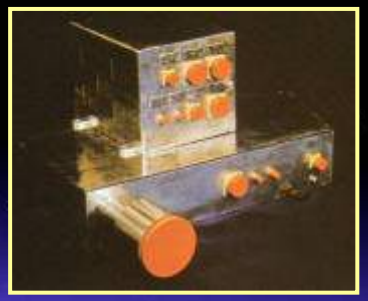
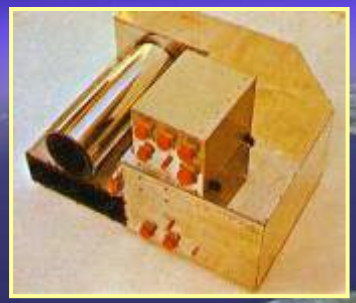
TWO Bulgarian cosmonaut space flight PROGRAMS realized – 1979,1988

Developed unique experience and infrastructure in program management, numerous space born and ground instrumentation development, fundamental sciences and other related areas

SUCCESSFUL STORIES

Two complete satellite programs: "BULGARIA 1300-I" and "METEOR-PRIRODA"





- BULGARIA 1300- for studies in the field of space physics;

RODA - for remote sensing of the Earth.

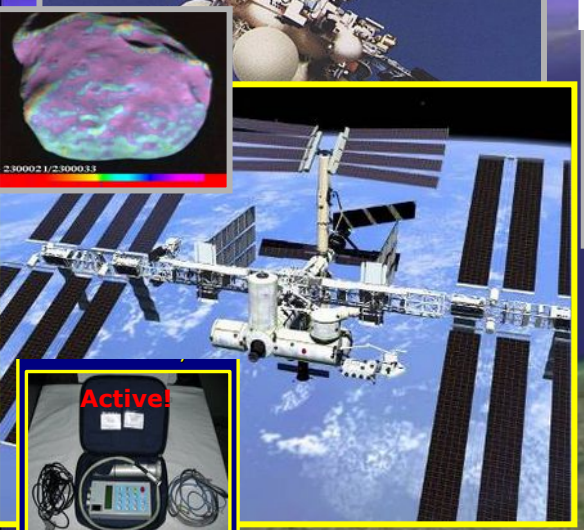
SUCCESSFUL STORIES

Strong Bulgarian hardware and methodology participation in a numerous un-manned and manned space missions aboard Russian, US, European, Indian and Japanese space vehicles, providing scientific instrumentation, data processing, methodologies and other capabilities.. Some examples:

PHOBOS project

NEUROLAB project aboard MIR

R3DR instrument as part of ESA EXPOSE-R facility is working at the Russian segment of ISS since March 2009



Ljlin 5 personal dosemeters ACTIVE on ISS since 2005

SVET Space Greenhouse onboard the MIR SS

RADOM instrument on the Indian first Moon satellite - Chandrayaan-1

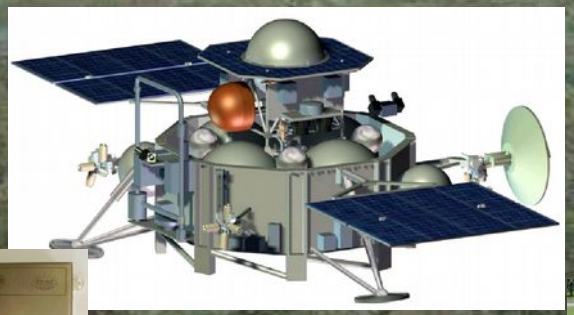
SUCCESSFUL STORIES …

International *Mars-500* experiment

Power LED Light Unit with different RGB spectra was designed to carry out plant experiments during the simulation of Manned Mars Mission.

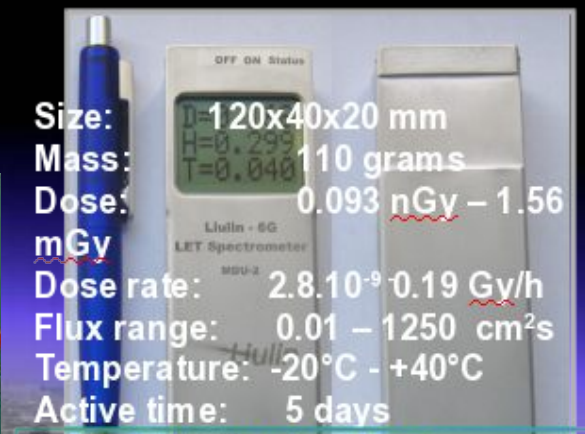
"Neurolab-B"

C-12 - 12-channels
ECG – touch panel



Phobos - Soil sample return apparatus

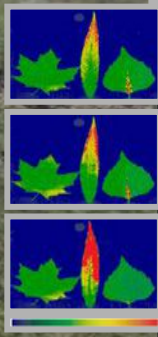
Personal radiation dosimeter Liulin-6G



Size: 120x40x20 mm
Mass: 110 grams
Dose: 0.093 nGy – 1.56 mGy
Dose rate: $2.8.10^{-9}$ 0.19 Gy/h
Flux range: 0.01 – 1250 cm^2s
Temperature: -20°C - +40°C
Active time: 5 days

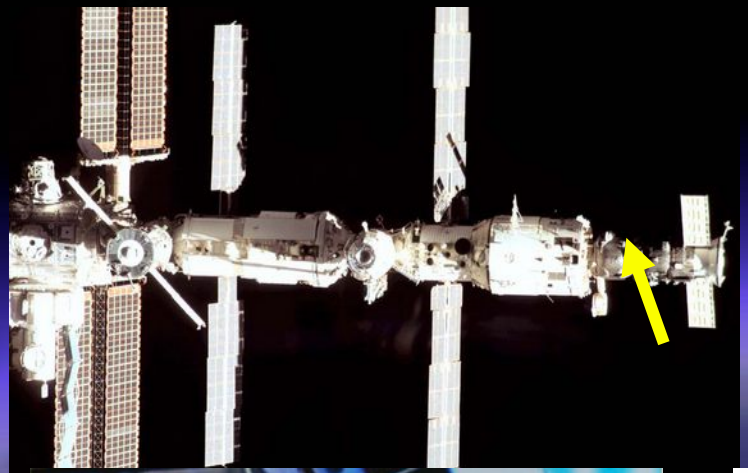
First row: Absorbed dose (μGy/h)
Second row: Calculated apparent *H*(10)* (μSv/h)
Third row: Accumulated since the beginning of the measurements absorbed dose (μGy)

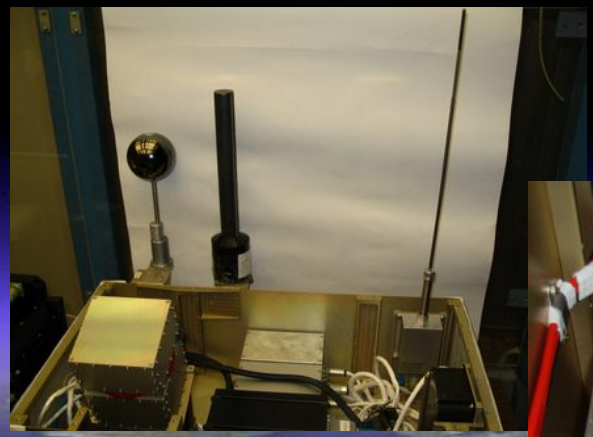
Hyperspectral and plant fluorescence imaging

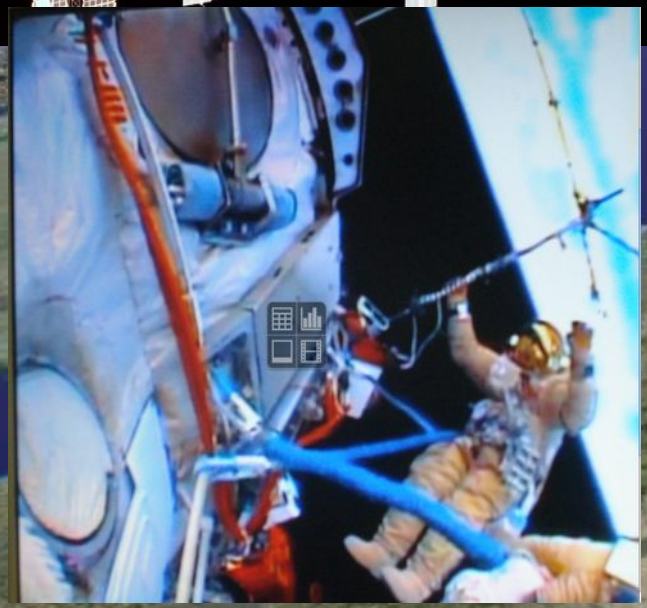


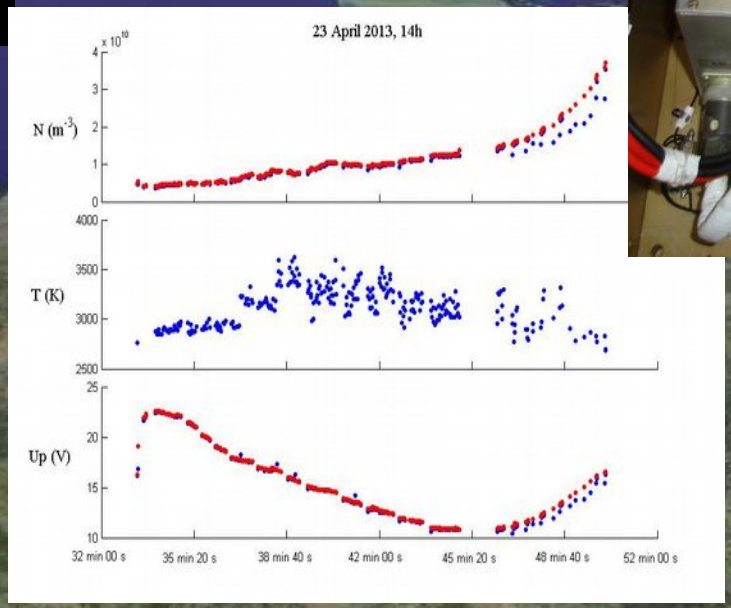
SUCCESSFUL STORIES…

ISS plasma charging study – OBSTANOVKA Experiment- on-going









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CONCLUSIONS

- Bulgaria has strong tradition and state of the art expertise and know-how in space exploration – development and implementation of complete scientific and applied research programs; development and deployment of space instrumentation, space fundamental science, ground segment and all related areas.

- Government administration is taking active steps to re-establish efficient national coordination and execution mechanisms for the space and the related R&D and industrial activities within the EU and ESA.

- Various Bulgarian organizations - Academia, Business entities, SME, Industry and NGOs are taking the initiative bottom-up to consolidate the national capacity in space R&D, technology development and transfer, including the related businesses development to the benefit of society

A journey of a thousand miles begins with a single step

千里之行，始於足下

(qiānlǐ zhī xíng, shǐ yú zúxià)

Laozi

LET US DO IT TOGETHER