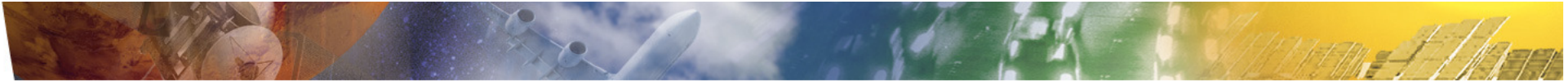


Small Satellites for Capacity Building in Space Technology Development

Rainer Sandau
International Academy of Astronautics IAA



Small Satellites

Large Satellites

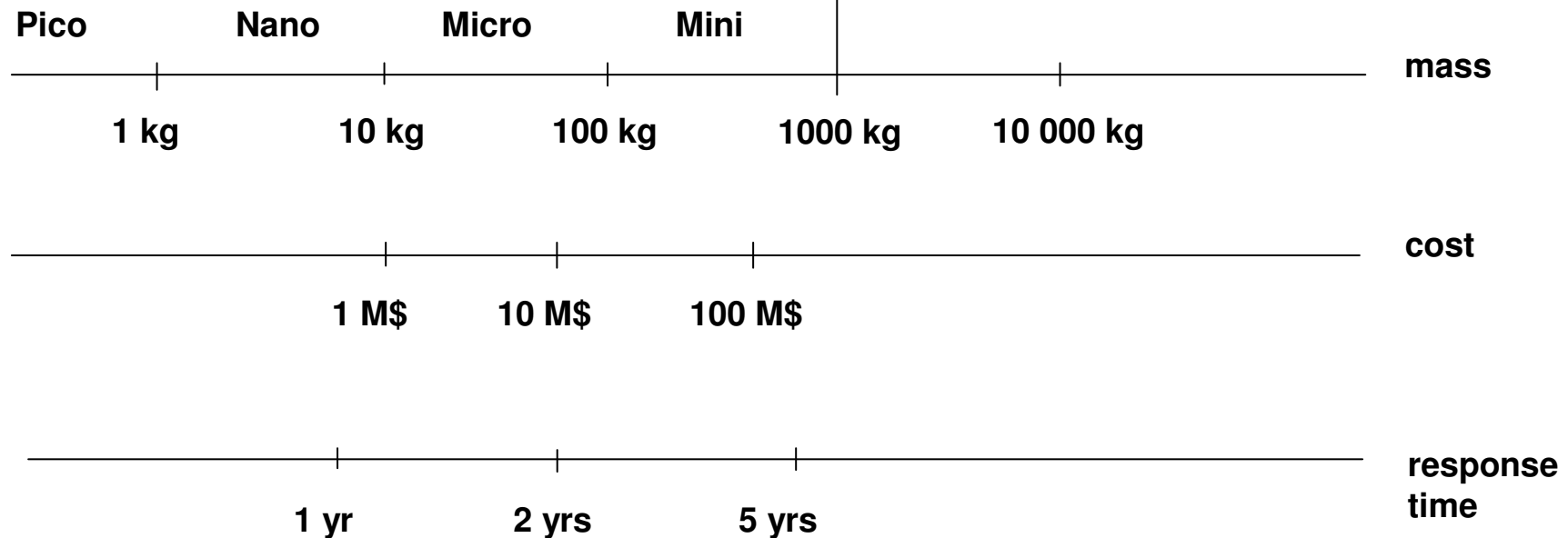
CubeSat:

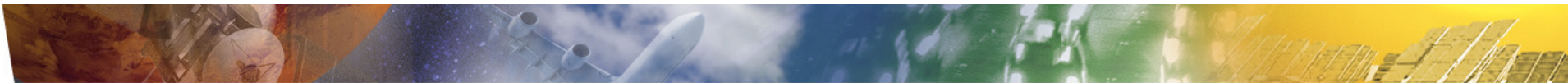
1 kg, ca. 2 yrs, 0.2 M\$

ENVISAT:

8 t, 15+ yrs, 3×10^9 \$

examples





Optical Small Satellites

Spatial Resolution

Increasing

Example: Eros-B/PIC-2
Launch 25.04.2006
Mass 290 kg
GSD 0.72 m
(Proba/pan GSD 4m)



Spectral Resolution

Increasing

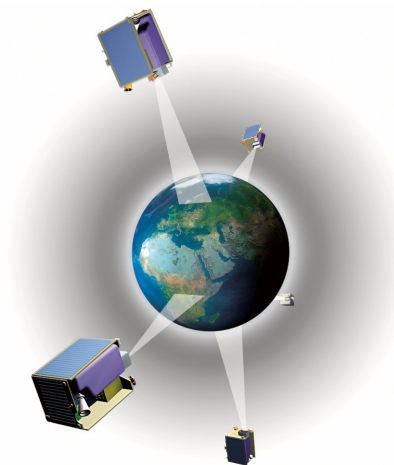
Example: Proba/CHRIS
Launch 22.10.2001
Mass 95 kg
Hyperspectral Imager

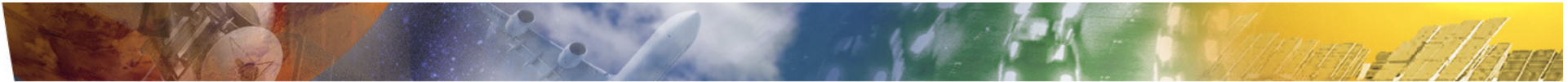


Temporal Resolution

Unique opportunity for affordable Constellation

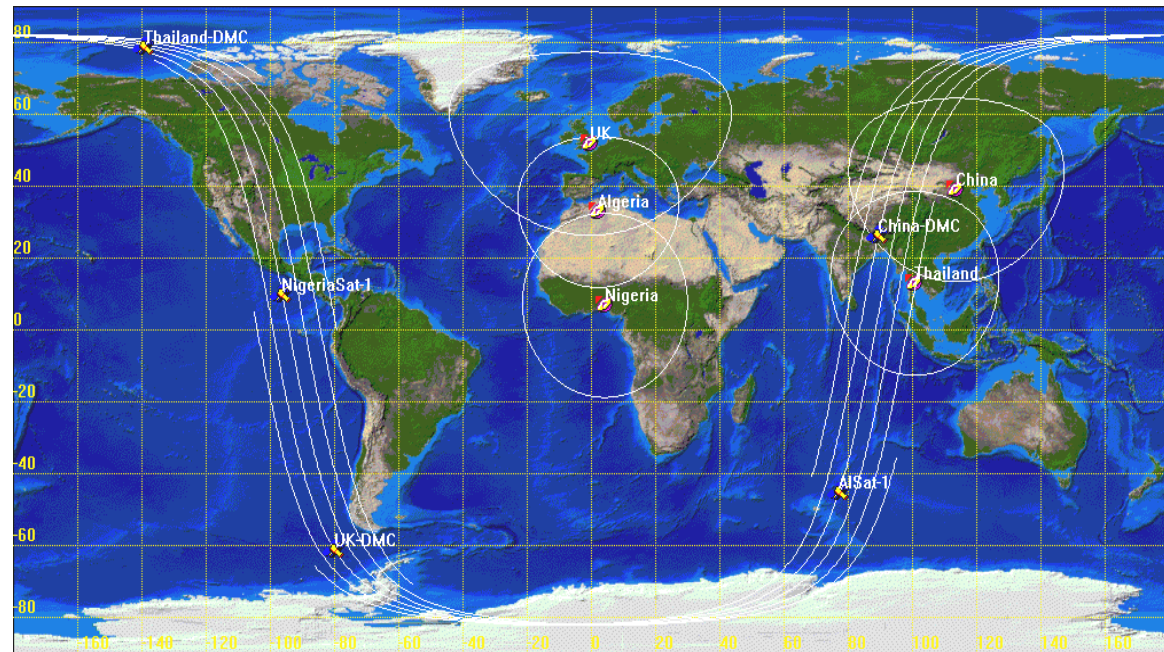
Example: DMC
RapidEye





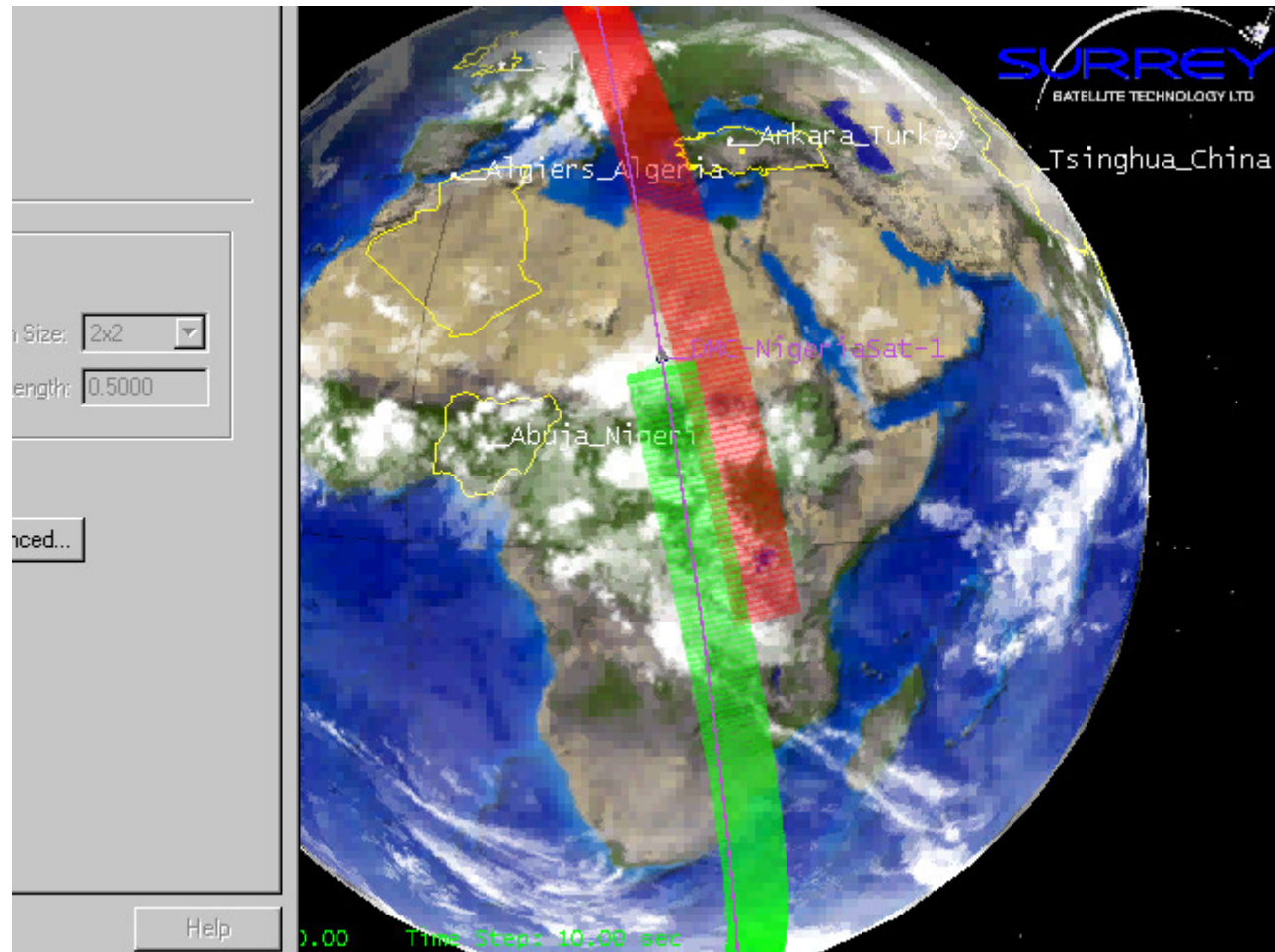
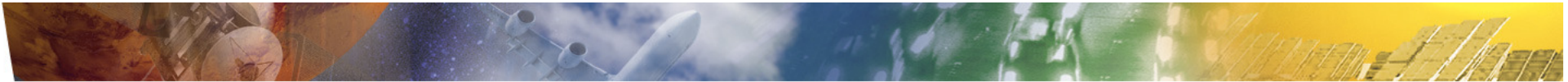
Disaster Monitoring Constellation DMC-1

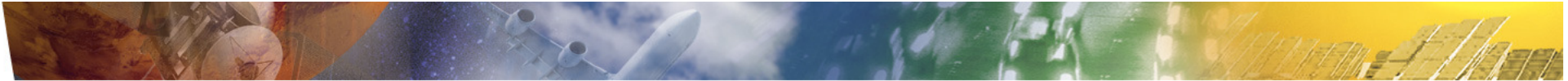
- AISat-1
- BILSAT-1
- NigeriaSat-1
- UK-DMC-1
- Beijing-1



- launched with three COSMOS launchers into the same orbit

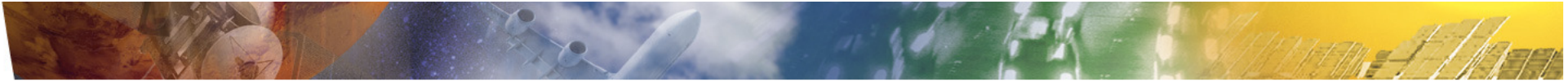
32m GSD, 600km swathwidth



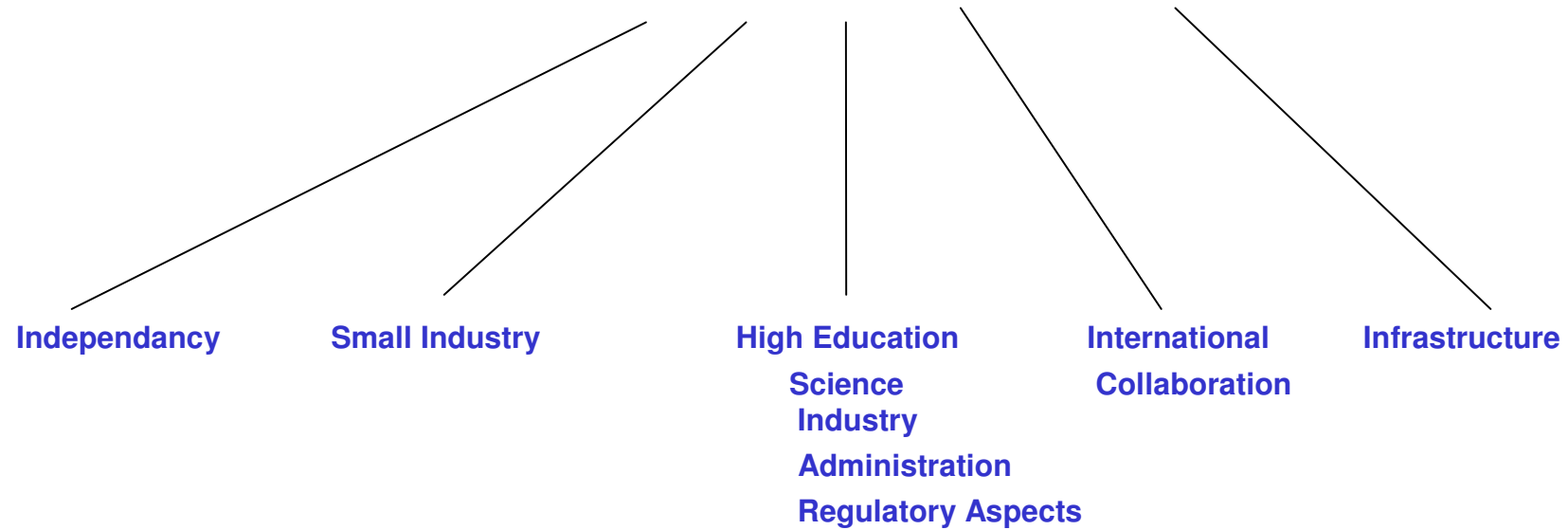


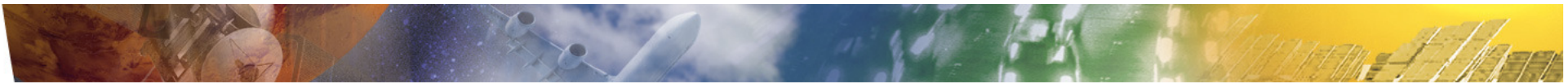
Small Satellites an opportunity

- **To do more with less.**
- **To meet local and global needs.**
- **To focus infrastructure development of a country**
- **High education for science, technology and management**
- **Greater involvement of local and small industry,**
- **Fast expansion of technical/scientific knowledge base,**
- **Independence in space,**
- **Earth Observation /defence capability, without relying on inputs from the major space-faring nations**



Small Satellite Missions





IAA and Small Satellites at IAC

IAA SYMPOSIUM ON SMALL SATELLITE MISSIONS

UN/IAA WORKSHOP ON SMALL SATELLITE AT THE SERVICE OF DEVELOPING COUNTRIES

1997 Turin, Italy

1998 Melbourne, Australia

1999 Amsterdam, The Netherlands

2000 Rio de Janeiro, Brazil

2001 Toulouse, France

2002 Houston, USA

2003 Bremen, Germany

2004 Vancouver, Canada

2005 Fukuoka, Japan

2006 Valencia, Spain

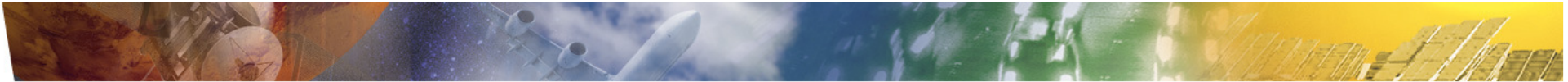
2009 Daejeon, Korea

2007 Hyderabad, India

2010 Prague

2008 Glasgow, UK

2011 Canetown



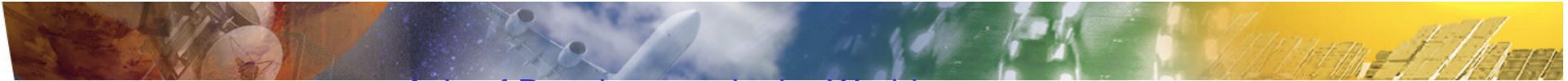
IAA in Africa: Conferences Abuja 2006, 2008, 2010





IAA in Africa: Conference Tunisia





Axis of Development in the World

After two Regional Association of IAA members

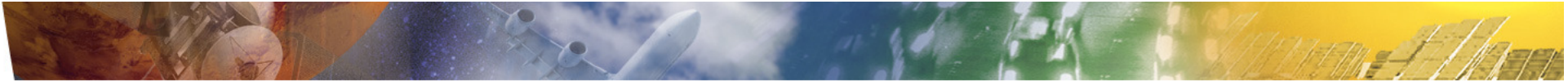
Russia (1995) and Ukraine (2003)

Opening IAA Nodes (Regional Centers)

Abuja (Nigeria), opening ceremony Dec 1st 2010

Buea (Cameroon) opening ceremony Dec 7th 2010





Sustainable Development Program of IAA

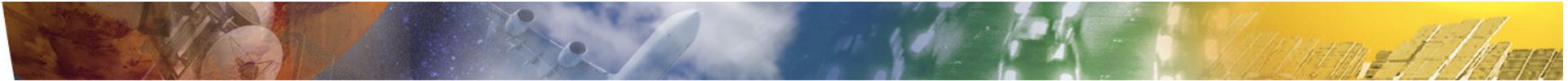
critical enablers missing:

local key expertise

IAA will provide the key expertise

organize/co-ordinate processes from the wish to the operational phase having the first small satellite system in orbit

Goal: to establish, conduct and monitor related projects



Axis of Development in the World

IAA consider embarking in new projects of global scale:

- **IAA Sustainable Program for small satellites:**
 - **Tunisia,**
 - **Syria,**
 - **Cameroon**

- **Disaster Management: IGMASS**
- **IAA Study Center:**
 - **Data Exchange in Remote Sensing**
 - **Data Exchange in Earthquake prediction**
- **Life Science spinoff: Telemedicine for Africa**