IAA Position Paper on Cost Effective Earth Observation Missions

IAA Study Group Members

EXECUTIVE SUMMARY

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1.0 INTRODUCTION

- Paper will concentrate on exploration and applications of Earth observation missions.
- Include historical perspective, as spacecraft have evolved from the small satellites of the 1960s through the *observatory class* spacecraft, and back to the formulation of the small satellites of today and tomorrow.

2.0 DEFINITION OF COST-EFFECTIVE EARTH OBSERVATION MISSIONS

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3.0 BACKGROUND MATERIAL AND ORGANIZATIONAL SUPPORT

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3.1 Studies

3.1.1 IAA Small Satellites I, II

3.1.2 COCONUDS

3.2 Organizations and Programs

3.2.1 United Nations

3.2.2 CEOS

3.2.3 ESA

3.2.4 COSPAR

3.2.5 IAF

4.0 MISSION COST DRIVERS

4.1 Types of satellites and low-cost approaches

4.2 Space segment

4.2.1 Payload

4.2.2 Spacecraft

4.2.3 Quality Assurance

4.3 Ground segment

4.3.1 Mission control

4.3.2 Data reception, distribution and archiving

4.3.3 Quality Assurance

4.4 Mission Operations

4.4.1 Mission life and automation

4.5 Access to space – Launch Vehicle

4.6 Management and Organizational Approach

5.0 COST MODELING

- Explore relationship between cost models and mission costs: a self-fulfilling prophecy?
- Collaborative cost models

6.0 APPROACHES TO ACHIEVING COST EFFECTIVE MISSIONS

6.1 Dedicated Missions, off-the-shelf Technology

6.2 Advanced Technology Approach

- Mention practical limitations in exchanging technology (e.g. ITAR, etc.)

6.3 Distributed Space Systems (Constellations) Approach

- Leverage on existing missions for collaborative real-time observations *or* post-processing data exchanges.
- Integrate operational systems, such as GPS, GPM, others.
- Distributed Space Systems

6.4 Non-Space Flight Observation Campaigns

- Unmanned Aerial Vehicles (UAVs), Ballons, Sounding Rockets, etc.

6.5 Pooling of Contributions and Funding

- Hightlight the distinction between absolute and relative costs: Collaborative missions tend to have a higher aggregate cost (absolute cost), but a lower cost to contributing organizations (relative cost).

6.6 The Role of Sensor Webs

- Integrating satellite constellations, non-space-flight campains, and pooling of constributions and funding

7.0 APPLICATION FIELDS, STATUS QUO AND PROSPECTS

- Introduce: Mention Land/Ocean resources will be split into individuial items. Agiculture, forestry, oil/minerals, fisheries.
- Spatial/temporal scales are different for each application
- CEOS: Atmosphere, Land, Ocean, Snow and Ice

7.1 Disaster warning and support

7.1.1 Status quo

7.1.2 Prospects

7.2 Agriculture

7.2.1 Status quo

7.2.2 Prospects

7.3 Forestry

7.3.1 Status quo

7.3.2 Prospects

7.4 Ocean and Coastal Zone

7.4.1 Status quo

7.4.2 Prospects

7.5 Atmosphere

7.5.1 Status quo

7.5.2 Prospects

7.6 Weather and Climate

7.6.1 Status quo

7.6.2 Prospects

7.7 Ice and Snow

7.7.1 Status quo

7.7.2 Prospects

7.8 Mapping and Geographic Information System Applications

- Surveilance and Pollution Monitoring

7.8.1 Status quo

7.8.2 Prospects

8.0 TRAINING AND EDUCATION

- NATO advanced studies institute
- International Space University
- ITC in Holland
- University Nano-satellite Program, other flight programs around the world.

9.0 CONCLUSIONS AND RECOMMENDATIONS

10.0 REFERENCES

1. First Author, 2nd Author, *Title*, Acta Astronautica, **46**, 287-296, 2000.
2. First Author, 2nd Author, *Title*, Conference Name, Geographic Location, Date.
3. etc.