CEOS Land Surface Imaging Constellation
Study Team Meeting

ESA/ESRIN
Frascati, Italy
June 18, 2007

Meeting Summary

The CEOS Land Surface Imaging (LSI) Constellation Study Team held its first face-to-face meeting in Frascati, Italy on Monday, June 18, 2007. The meeting was held in conjunction with the 20th meeting of the CEOS Strategic Implementation Team (SIT) and a SIT-sponsored CEOS Constellations Workshop.

The meeting was co-chaired by G. Bryan Bailey (USGS) and V. Jayaraman (ISRO). Participating in the meeting were the following LSI Constellation Study Team Members (or their representative): Herve Jeanjean (CNES), Gilberto Câmara (INPE, for Joao Vianei Soares), Michael Berger (ESA), DeWayne Cecil (NASA), Ana Medico (CONAE), Frédéric Achard (JRC, for Alan Belward), Stephen Ungar (CEOS WGCV), and Jean Pierre Antikidis (CEOS WGISS). Also participating in the meeting were Ivan Petiteville (CEOS WGISS Chair), Changyong Cao (CEOS WGCV Chair), Stephen Sandford and Brian Killough (CEOS Constellations SEO), Tim Stryker (USGS), Laura Frulla (CONAE), and B. Vasudevan (ISRO).

Bryan Bailey welcomed Study Team members and other participants to the meeting and thanked them not only for their participation in the meeting, but also for their support of LSI Constellation Study Team activities. He then presented the meeting objectives as:

- Review 2007 LSI Constellation activities and progress.
- Reaffirm (or not) general satisfaction with LSI Constellation goals and objectives.
- Advance the 2007 Work Plan, including accepting increased responsibility for tasks yet to be accomplished.
- Define and "staff" the work for the 2nd half of 2007.
- Final preparation for tomorrow's Constellations Workshop
- Briefly look to 2008 priorities.

Following a review of the meeting agenda (Attachment 1) and a round of self-introductions, Stephen Briggs (ESA), representing the SIT Chair, welcomed the meeting participants to Frascati and to ESA ESRIN. He also shared with the group some personal reflections about the CEOS Constellations, speaking about their origin but also about their potential role and importance in advancing the cause of Earth Observation now and in the years ahead. Similar comments of welcome and encouragement were offered a bit later by CEOS Chair Barbara Ryan (USGS) and by (via telephone) SIT LSI Constellation Liaison, David Williams (BNSC). The encouraging words were well received and appreciated by the meeting participants.

Next, Bryan Bailey led a review of LSI Constellation Study Team activities to date in preparation for a detailed review and discussion of the 2007 LSI Constellation Work Plan. This included a brief review of the formal proposal prepared and submitted to CEOS SIT for a LSI Constellation, and it included an overview of the 2007 Work Plan. Discussion on this topic, as was characteristic of the entire meeting, was vigorous and free flowing. This resulted in excellent exchange of ideas among the participants throughout the meeting.

It is impossible to capture the full details of the discussions that took place during the meeting, but it is possible to summarize the important highlights of the topics addressed by the meeting and to list the actions taken by Study Team members.

The first goal of the 2007 LSI Constellation Work Plan is to ***establish agreement(s), among space agencies that currently operate mid-resolution land surfacing imaging satellite systems, to cooperate more closely together to operate those systems as a real prototype Land Surface Imaging Constellation***. Study Team members discussed the draft *Declaration of Intent* for expanded cooperation in operating mid-resolution LSI systems previously distributed, and after making some rather minor edits, they approved the revised *Declaration of Intent* (Attachment 2). Study Team members whose agencies currently operate a mid-resolution LSI system took an **Action to seek approval from their agency of the approved *Declaration of Intent* (by August 31).**

Next, Study Team members received a presentation from Gilberto Câmara (INPE) that described a proposal for general data policy guidelines for mid-resolution LSI data that could form the basis for related data and operations policy to be embraced by operators of mid-resolution LSI systems. This is the first of three areas where annexes or sub-agreements to the *Declaration of Intent* are to be developed by the LSI Constellation Study Team in the coming months and circulated to appropriate agencies for review and hopefully adoption. Discussion about the proposal among Study Team members was lively, and good ideas were exchanged.

The purpose of the sub-agreements is to add specificity about the cooperation described in the *Declaration of Intent*. The area of data access or data policy was the only one of the three topical sub-agreement areas for which significant work had been done prior to the Study Team meeting. Work is still needed to define specific cooperation related to ground systems operations and data acquisition & data management strategy.

The situation is similar as relates to the 2nd main goal of the 2007 LSI Constellation Work Plan, which is to ***develop preliminary standards for a mid-resolution Land Surface Imaging Constellation***. Work is still needed to compile a representative suite of user requirements upon which to base constellation standards, the preliminary standards still need to be defined as relate to 1) the space segments, 2) ground segments, and 3) policies and operations.

Following extensive discussion about the work remaining to be accomplished in 2007 and about the most efficient and effective ways to accomplish the work, the Study Team decided to reduced the number of sub-groups proposed to accomplish the work from six to three and logically to combine

certain work tasks from Goal 1 with those from Goal 2. The new topical area sub-groups established are:

- Space Segment
  - Steve Ungar, CEOS WGCV (Lead)
  - Herve Jeanjean , CNES
  - Michael Berger, ESA
  - A.S. Kirnakumar, ISRO
  - Chu Ishida, JAXA

- Ground Systems
  - Jean Pierre Antikidis, CEOS WGISS (Lead)
  - Michael Berger, ESA
  - V.K. Dadhwal, ISRO
  - DeWayne Cecil, NASA
  - Daniel DeLisle, CSA
  - Kevin Gallo, NOAA

- Data and Operations Policy
  - Joao Vianei Soares, INPE (Lead)
  - V. Jayaraman, ISRO
  - Ana Medico, CONAE
  - Bryan Bailey, USGS

Based on discussions at the Team Meeting the following areas of responsibility were assigned to the three sub-groups. The Space Segment sub-group is primarily responsible for defining a preliminary set of standards for the space segment components of a mid-resolution LSI Constellation. The Ground Systems sub-group is responsible both for 1) recommending specific ways in which agencies that operate current mid-resolution LSI systems can better cooperate in the area of ground systems (including user interface systems and data management systems) operations to make their collective systems more useful to the user community, and 2) developing preliminary standards for the ground segment components of a mid-resolution LSI constellation. The Data and Operations Policy sub-group is responsible for 1) proposing data and operations policy guidelines that agencies that operate current mid-resolution LSI systems could adopt in the near-term to make their data more available and/or useful to the user community, 2) proposing data and operations policy guidelines as preliminary standards for mid-resolution LSI systems of the future, and 3) recommending specific ways in which agencies that operate current mid-resolution LSI systems can better cooperate in the acquiring data from those systems to the greater benefit of the user community. This task should include addressing potential data gap issues.

In addition to the three newly established sub-groups, Bryan Bailey agreed to lead a user requirements sub-group comprised (largely) of the user community members of the Study Team. This sub-group will be responsible for compiling a representative cross-section of user information and technical requirements (as related to mid-resolution LSI systems) that will form the basis for the preliminary constellation standards that will be defined by the other three topical area sub-groups.

The Leads of the newly established sub-groups accepted an **Action to work with their sub-group members to accomplish their respective deliverables, both as relate to Goal 1 and Goal 2 of 2007 Work Plan, by October 1.**

The 3rd main goal of the 2007 LSI Constellation Work Plan is to ***meaningfully contribute to the production of a fundamental climate data record (FCDR).*** Specifically, the goal is to contribute the land surface image data required to complete the U.N. FAO Forest Resource Assessment 2010 (FRA2010). Two main tasks need to be accomplished in order to meet this goal. First, the specific LSI data requirements for the project need to be defined and provided to the LSI Constellation Study Team. Secondly, agreements to provide data must be established with agencies that have the LSI data needed by the project.

Frédéric Achard (JRC) reported on the status of efforts to define the specific data requirements of the FRA2010. He explained the overall data strategy for the FRA2010, which is closely tied to Tri-Decadal Global Landsat Orthorectified data set that includes global coverage from approximately 1975, 1990, and 2000. In addition, FRA2010 will use the Mid-Decadal Global Land Survey (MDGLS) data set being compiled by NASA and the USGS largely from existing Landsat 7 ETM+ and Landsat 5 TM data for the period 2004-2006. The data that FRA2010 is looking to the LSI Constellation to provide are data to cover gaps in the MDGLS, and to a lesser extent gaps in the 1990 and 2000 epochs of the Tri-Decadal data set. Currently, those gaps are in the process of being identified. Bryan Bailey took an **Action to work with Frédéric Achard and Alan Belward to finalized detailed data requirements for FRA2010 and with the Data and Operations Policy task area to establish agreements with appropriate agencies to provide the needed data.**

Brian Killough (NASA), representing the CEOS Constellations System Engineering Office (SEO), presented an overview of the SEO activities and plans. The SEO is located at NASA's Langley Research Center and has been working closely with the Atmospheric Composition Constellation. However, it is trying to develop capabilities that will benefit all four prototype constellations.

Tim Stryker (USGS) presented an overview of the CEOS Constellation visualization efforts to develop visual illustrations of the potential benefits of the constellations. The general idea is to use state-of-the-art display technologies, such as GeoWall, to illustrate the CEOS Constellation concept and benefits by focusing on one (or possibly more) applications from each of the disciplines represented by the four CEOS Constellations. The visualization display will be highlighted at the CEOS Plenary and at the GEO Summit in Cape Town, SA. Team members agreed to the following **Action: Study Team members to email Co-Chairs one or more ideas for an LSI Constellation visualization example.** ***Please cite the application to be addressed and the data sets to be used*** **(by July 6).**

Prior to adjourning, the Study Team briefly considered what activities it should focus on in 2008. For example, given the focus in 2007 on mid-resolution systems, perhaps the focus next year should be on a different component of a LSI Constellation, such as radar or coarse-resolution systems. No consensus was reached, and the Co-Chairs took an **Action to seek input from Study Team members on 2008 LSI Constellation Study Team priorities (by November).**

Actions taken during the meeting were summarized as follows:

1. **Study Team members from space agencies that have current mid-resolution LSI systems in space to seek approval from their agency of the *Declaration of Intent* (by August 31).**

2. **Topical Area Sub-Group Leads to work with their sub-group members to accomplish their respective deliverables, both as relate to Goal 1 and Goal 2 of 2007 Work Plan (by October 1).**

3. **Bryan Bailey to work with Frédéric Achard and Alan Belward to finalized detailed data requirements for FRA2010 and with the Data and Operations Policy task area to establish agreements with appropriate agencies to provide the needed data (ASAP).**

4. **Study Team members to email Co-Chairs one or more ideas for an LSI Constellation visualization example. Please cite the application to be addressed and the data sets to be used (by July 6).**

5. **Co-Chairs to seek input from Study Team members on 2008 LSI Constellation Study Team priorities (by November).**

6. **Co-Chairs to provided additional guidance to Topic Area Sub-Group Leads on operational procedures (by July 15).**

The meet adjourned just before 5:30 p.m.

ATTACHMENT 1

CEOS Land Surface Imaging Constellation
Study Team Meeting

ESA/ESRIN – Room E
Frascati, Italy
June 18, 2007

Preliminary Agenda

8:30 Registration	Room E
9:00 Welcome, Meeting Objectives, & Review Agenda	Co-Chairs
9:15 Introductions	All
9:30 Welcome & Comments	
• CEOS Chair	B. Ryan, USGS
• CEOS SIT Chair	S. Briggs, ESA
• SIT LSI Constellation Liaison	D. Williams, BNSC
9:45 LSI Constellation Review & Context Setting	Co-Chairs/Study Team Discussion
• Proposal Highlights	
• Overview of 2007 LSI Constellation Work Plan	
10:15 Short Break	
10:30 Detailed Review and Discussion of 2007 Work Plan	Study Team
• Goal 1 – ***Agreements to cooperate more closely in the operation of existing mid-resolution LSI systems***	
▪ Background & Context	Co-Chairs
▪ Higher-level Agreement	T. Stryker, USGS
▪ User Survey	Co-Chairs
▪ Sub-Agreements	
– data access	G. Câmara, INPE
– ground systems operations	ST Discussion
– data acquisition/data management strategy	ST Discussion
▪ Summary & Actions	Co-Chairs
12:00 Lunch	

1:00 Detailed Review and Discussion of 2007 Work Plan (cont.)

- Goals 2 – ***Preliminary standards for a mid-resolution Land Surface Imaging Constellation***
  - Background & Context — Co-Chairs
  - Compile User Information & Technical Requirements — ST Discussion
  - Develop Preliminary Standards for Mid-Resolution Systems — ST Discussion
  - Summary & Actions — Co-Chairs

- Goal 3 – ***Data for a Fundamental Climate Data Record***
  - Background & Context — Co-Chairs
  - Data Requirements for FRA 2010 — F. Achard, JRC
  - Agreements/Plan to Provide Data for FRA 2020 — ST Discussion
  - Summary & Actions — Co-Chairs

3:00 Short Break

3:15 LSI Constellation Resources — Co-Chairs
- CEOS Systems Engineering Office — B. Killough, NASA
- Contractor Support — T. Stryker, USGS

3:45 Constellation Visualization Efforts for CEOS Plenary & GEO Summit — T. Styker, USGS

4:30 Review of Actions — Co-Chairs

4:45 Brief Discussion on 2008 LSI Constellation Priorities — Study Team

5:00 Adjourn

ATTACHMENT 2

Declaration of Intent by Member Agencies of the Committee on Earth Observation Satellites for Cooperation on Mid-Resolution Land Surface Imaging Satellite Systems in Support of the CEOS Implementation Plan

WHEREAS: Several member space agencies of the Committee on Earth Observation satellites (CEOS) currently operate mid-resolution visible to thermal infrared land surface imaging satellite systems, with a ground sample distance resolution of 10 to 100 meters.

WHEREAS: Data collected from these systems are extremely valuable sources of information used to study and monitor Earth conditions and processes and to solve problems to the benefit of society;

WHEREAS: The CEOS Constellations Concept has emerged as the innovative planning process intended to augment national government planning and support international coordination of space-based Earth observations;

WHEREAS: Routine, well-calibrated, and frequent imaging of the Earth's land surfaces and coastal areas at synoptic to global scales has proven to be of great benefit to society and holds even greater promise for the future.

WHEREAS: Important opportunities exist to provide users with better and more consistent data more frequently and more easily through enhanced collaboration and coordination among agencies in their planning, development, launch, and operation of future moderate-resolution land surface imaging satellite systems;

WHEREAS: A constellation of mid-resolution land surface imaging satellites would enhance the benefit of Earth observation to society in many ways, including improved monitoring of the effects of climate change; planning and monitoring of the Earth's resources; discovery of critical energy and mineral resources; enabling societies to better prepare for and respond to natural disasters; studying and maintaining Earth's fragile ecosystems and its biodiversity; addressing human health issues; and helping to undertake many other scientific and practical endeavors beyond the scale of scientific and observational capabilities available today;

WHEREAS: A land surface imaging satellite constellation could improve the quality of life for citizens of all nations, aid in preserving the natural state of the Earth for all future generations, and foster the prospect for peaceful coexistence for all nations and peoples;

The undersigned CEOS space agencies resolve to realize the benefits of a Land Surface Imaging Constellation by actively seeking ways to cooperate more fully in the operation of their existing mid-resolution land surface imaging satellite programs. These agencies will seek to develop the appropriate measures and agreements to manage current and future satellite systems according to a common set of criteria and objectives. These agencies will also consult closely with one another in future development of national satellite systems so as to develop a more robust, coordinated, and comprehensive global approach to global land surface imaging.

The undersigned agencies resolve to work through the CEOS Land Surface Imaging Constellation Study Team to define specific cooperative measures to achieve these objectives.

SIGNED:

_____
Centre National d'Etudes Spatiales

_____
Chinese Academy of Space Technology

_____
Comisión Nacional de Actividades Espaciales

_____
Instituto Nacional de Pesquisas Espaciais

_____
Indian Space Research Organization

_____
Japan Aerospace Exploration Agency

_____
U.S. National Aeronautics and Space Administration

_____
U.S. Geological Survey, U.S. Department of Interior