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Minutes of Meeting
IAA Commission IV
Space Systems Operations and Utilization

March 17, 2009
Location : IAA, Paris

1. Welcome and Introduction

Attendees: see Appendix 1

2. Study Groups activities

Commission 4 has 3 on-going Study Groups : Knowledge Management, Hitch-hiking to the Moon, and Quality considerations for space programmes. Proposals for two new Study Groups are in preparation : Integrated Applications and International Aerospace System for Monitoring of Global Geophysical Phenomena.

SG 4.1 - Knowledge Management (J. Holm)

The group has organised the second *International Conference on Knowledge Management for Aerospace* at Pepperdine University, Malibu, California, September 9-11, 2008. Papers were solicited from government, academia, and industry. There were 125 attendees

The group continued focus on US industry, meeting 4-6 times a year, with representatives of key industrial companies, as well as universities.

Roberta Mugellesi Dow organised a one-day Workshop on Knowledge Management for Spacecraft Operations on the 18 February 2009 in ESOC. Approximately 30 participants from different companies have attended.

Connection was established with external activities : NASA has formalized an Information and Data Management Program that will support the coordination of knowledge management standards and interfaces with other space organizations. Study Group Chair leads that area of the new program. NASA and U.S. Air Force are funding work to formalize an ontology for aerospace internationally. Meetings have been held with U.S. industry, ESA, U.S. government organizations, Airbus, Rolls Royce Aerospace to test validity of concept. U.S. Federal Knowledge Management Working Group has broadened it's membership to include those interested in government issues for knowledge sharing globally.

A draft position paper on the recommended approaches for an aerospace organization to follow in knowledge management will be submitted next year.

SG 4.5 - Hitch-hiking to the Moon (L. Alkalai)

Working meeting was held in October 09 at Glasgow IAC. The study group is moving slow, since L. Alkalai is very busy. There are a lot of “registered” people, … but it is hard to have them contributing. L. Alkalai suggests having a smaller core team to issue a summary position paper, instead of a “big book” as planned earlier. This position paper would be circulated for comments from all the members of the Study Group.

Then, a more consistent paper could be issued, substantiating the messages from this first summary

L. Alkalai intends to have the summary paper delivered at the Berlin meeting

SG 4.8 Space systems cross compatibility

J. Esper was not attending to present the status, but sent a status report (Appendix 2)

Standby : Integrated Applications (A. Ginati and M. Grimard)

A. Ginati reported on the progress of the Integrated Applications topic in ESA : a program with a budget has been decided during November 2008 Ministerial Conference.

M. Grimard explained the strategy for concretely implementing the Study Group : we need to catch a network of people who are ready to be active. Therefore we are looking for IAC Daejon Symposium to build this network. If not successful at Daejon, we will wait for Prague in 2010. The issue is to catch user community and not people from the classical space community, just looking to propose new products.

Today the issue is to have the concept understood and shared beyond Europe, since the list of abstracts for Daejon has shown that there are some issues of misunderstanding.

L. Alkalai proposes to provide relevant contacts in NASA.

R. Hornstein suggests using ISU to disseminate the Integrated Applications concept.

New proposal : International Aerospace System for Monitoring of Global Phenomena (Prof V. Menshikov)

S. Lysyy presented the concept, which is starting from on-going international actions for global monitoring of the Earth (GEOSS, DMC, GMES, …). The idea is to analyse the feasibility of using these systems to distribute data for a global warning real-time system.

The following concerns have been expressed by Commission 4 members :

- Study group products should be position papers, identification of users and challenges
- Broaden the membership of the Study Group to include international participants such as China, Japan, South America, Formosa, and India
- Focus more on recommendations of types of system rather than a specific system or proposal
- Should find out what is going on at NASA (such as the GRACE mission) to connect into the Study Group

However the time is right now for this type of system : for instance there are currently no capabilities for prediction of earthquakes, and the Study Group proposal would help with that.

The next step shall be to establish a broader list of study group members, to be reviewed by Commission 4 members.

3. Program Committee Activities

B.5 Integrated Applications (A. Ginati)

17 papers have been proposed for one session, and 9 for the other. There are about 7 papers in each session for acceptance, to which some papers from other sessions might be added if relevant.

A lot of abstracts have been out of the scope, the concept of Integrated Applications being not well understood, in particular by Chinese people. For Prague, the wording of the call for paper will be improved.

D.5 Safety & Quality (J. Holm)

For Daejon IAC 2009 we have 33 papers for 3 sessions, with good international representation and good distribution over the sessions :

- D5.1 - From Parts to Systems: Contribution of Tests on Performance Prediction and Assessment : 11 abstracts
- D5.2 - Quality and Knowledge Management in Aerospace Companies : 13 abstracts
- D5.3 - Preventing Spacecraft Failure From Space Environment Effects : 9 abstracts

Details are given in Appendix 4.

No large changes expected for Prague based on current experience. We have drafted a call for papers for Prague.

B.4 Small Satellite Missions (R. Hornstein)

150 papers for 8 sessions, 51 papers for a single session (hoping not to ask for another session for South Korea).

Sessions 4.7 and 4.8 we will likely shorten to half a session each to accommodate single session that needs to be split into two.

There is a preliminary call for papers for Prague, but will likely change to plan for two technology sessions (CubeSat and NanoSat).

The question is open whether to expand from 8 to 9 sessions for Prague.

4. Organizational Issues

- Rhoda, Larry, and Amnon will attend the SAC meeting to help resolve potential overlap between Earth Science and Small Satellite sessions.
- We can only have 10 official members of the Commission, Larry and Amnon to investigate if some members who are unable to attend regularly should be replaced.
- Acta Astronautica will accept all papers recommended for publication from the IAC, but they will then go through peer review process. No special selections or publications.
- Small Satellites meeting In Berlin (May 4-7) will have enough Commission members that there will be a short meeting on May 5

5. Report to the Scientific Activities Committee

L. Paxton and A. Ginati will report the Commission 4 activities to the Scientific Activities Committee, on the basis of these Minutes.

6. Next Meeting & Action Items

The next meeting of Commission 4 will be held in Daejon during IAC2009.

Attachment 1 : Participants list

Name	Organisation	Email
Larry Paxton	APL	larry.paxton@jhuapl.edu
Amnon Ginati	ESA	amnon.ginati@esa.int
Rainer Sandau	DLR (Germany)	rainer.sandau@dlr.de
Max Grimard	Astrium (France)	max.grimard@eads.net
Rhoda Hornstein	NASA Headquarters	rhoda.hornstein@hq.nasa.gov
Jeanne Holm	NASA JPL (USA)	jholm@jpl.nasa.gov
Jeng Shing Chern	China Institute of Technology	jschern@cc.hc.chit.edu.tw
Charlotte Mathieu	ESPI	Charlotte.mathieu@espi.or.at
Manola Romero	ONERA (France)	manola.romero@onera.fr
Pierre Bescond		pierre.bescond@laposte.net
Leon Alkalai	NASA JPL (USA)	leon.alkalai@jpl.nasa.gov
Sergey Lysyy		sergeylysy@gmail.com

Appendix 2
S.4.1. Knowledge Management of Space Systems Study Group Status Report

Responsible Commission:

- **IAA Commission 4: Space Systems Operations and Utilization**

Study Number and Title:

- **S.4.1. Knowledge Management of Space Systems**

Short Study Description

- Define the organizational and inter-organizational issues that support or inhibit knowledge sharing amongst aerospace organizations (including capturing knowledge of our key experts and aging workforce)
- Identify and recommend standards for knowledge management activities and initiatives to promote interoperability of key systems (such as lessons learned or publications)
- Create, through consensus, a position on the recommended approaches for an aerospace organization to investigate to excel at knowledge management

Website Study Information up to date?

- No

Issues requiring resolution?

- Status of IAF application for partner KM group?

Progress and Product Deliveries on Schedule?

- **Plan**: Support a better understanding among member and aerospace organizations of the ways in which they can share knowledge

    - **Action (ongoing):** Held second *International Conference on Knowledge Management for Aerospace* at Pepperdine University, Malibu, California, September 9-11, 2008. Papers were solicited from government, academia, and industry. Last year, there were 125 attendees. More at http://bschool.pepperdine.edu/newsevents/kmforum/
    - **Action (ongoing):** Scheduled third *International Conference on Knowledge Management for Aerospace* at Pepperdine University, Malibu, California, August 5-6, 2009.
    - **Action (ongoing):** Continue to co-lead a consortium of US aerospace industry, academia, and government space organization meetings on knowledge management. Team meets face-to-face 4-6 times a year. Participants include Northrop Grumman, The Aerospace Corporation, Boeing, Pratt Whitney Rocketdyne, Lockheed Martin, Raytheon, Computer Sciences Corporation, University of California at Irvine, Pepperdine University, California State University at Northridge, and NASA.

- **Plan**: Ensure that there is a set of related papers from workshop participants at the 2009 IAF conference that exemplifies excellent knowledge management practices at aerospace organizations.

    - **Action**: Continue to have combined Knowledge Management and Quality Management tracks.
    - **Action**: 12 papers submitted for the KM track for Daejeon.
        1. A Process of Code Inspection for Space Software
            - Mr. Marcos Romani <mromani@iae.cta.br>

    - Instituto de Aeronautica e Espaço (IAE)
2. A Refined Quality Control Method for Shenzhou-7 Manned Flight Mission
    - Mr. Jin yong <zhaozhigang077@yahoo.com.cn>
    - China Academy of Space Technology (CAST)
3. Apollo: Learning From the Past, For the Future
    - Mr. Michael Grabois <michael.r.grabois@nasa.gov>
    - United Space Alliance, LLC
4. Capturing Tacit Knowledge for Spacecraft Operations in ESOC
    - Ms. Roberta Mugellesi-Dow <Roberta.Mugellesi.Dow@esa.int>
    - European Space Agency (ESA)
5. Development and evaluation of a prototype cross-search system for aerospace technical data management
    - Mr. Yoshikazu Miyano <miyano.yoshikazu@jaxa.jp>
    - Japan Aerospace Exploration Agency (JAXA)
6. Learning from Space Operations: Lessons Learned as Drivers for Improvement
    - Mr. Stefano Scaglioni <stefano.scaglioni@esa.int>
    - European Space Agency (ESA)
7. Status of the IAA Knowledge Management Working Group
    - Mrs. Jeanne Holm <jholm@jpl.nasa.gov>
    - NASA/Jet Propulsion Laboratory
8. SWIFTER - Space Weather Informatics, Forecasting, and Technology through Enabling Research and Virtual Organizations
    - Mrs. Jeanne Holm <jholm@jpl.nasa.gov>
    - NASA/Jet Propulsion Laboratory
9. Taxonomy for Space: Knowledge Sharing Amongst Countries
    - Mrs. Jeanne Holm <jholm@jpl.nasa.gov>
    - NASA/Jet Propulsion Laboratory
10. The Implementation of Risk Management into the Concurrent Engineering Process
    - Mr. Andre Weiss <Andre.Weiss@dlr.de>
    - German Aerospace Center (DLR)
11. Knowledge Management for ESA's Planetary Missions
    - Mr. G.H. Schwehm and Joe Zender, et al.
    - ESA-ESAC, Spain and The Netherlands
12. Understanding and Implementing Knowledge Management Applied to the ESA Rosetta Mission
    - Mr. V. Dhiri, G. Schwehm, and J. Brinkmann <viney.dhiri@sciops.esa.int>
    - ESA-ESAC, Spain

- **Plan**: Ensure that there is a set of related papers from workshop participants at the 2010 IAC that exemplifies excellent knowledge management practices at aerospace organizations.
    - **Action**: Continue to combine Quality and Knowledge Management Track for track to be submitted for Daejeon.

- **Plan**: Information will be posted on a web site for each of communication and status reference.
    - **Action:** Group has an online collaboration workspace and discussion forums.
    - **Action:** Expanded online community to ~135 members.

- **Plan**: Establish a forum for the ESA/ESOC community to discuss current activities in KM and share best practices

    - **Action (ongoing):** Strengthen relationship with Contractors Companies doing business with D/OPS Directorate. One-day Workshop on KM for Spacecraft Operations on the 18 February 2009 in ESOC. Approximately 30 participants from different companies have attended including AIS. The workshop's focus was specifically on Knowledge Management (KM) topics relevant to ESOC, however the findings and recommendations have a high potential of application beyond ESOC and could contribute to the development of the ESA-wide KM system as well as be of benefit to the participating companies. The companies explained how they have organized KM generally within the company and also in their support to D/OPS and the processes they are using. Learning how KM issues are addressed by them should also help to improve the mutual understanding of knowledge management.
    - **Action (ongoing):** Establish a D/OPS community of practice to discuss current activities in KM and share best practices involving the interested contractors companies, and also applicable to other ESA Directorates like D/LEX and D/TEC (especially interested is the Concurrent Design Facility, to increase the synergy with ongoing study on real-time knowledge capture).
    - **Action (ongoing**): Clarify and resolve the ESA internal open issues emerged during the Workshop: KM incentives, simplifying wiki access procedure, sharing knowledge from ESA studies, addressing KM obligations in SoW, clarify IPR situation.
    - **Action (ongoing):** Strengthen relationship with between ESA and NASA to share standard practices on KM, ontologies, and lessons learned methodologies.

- **Plan**: Information on KM activities will be posted on the external ESA web site for communication and status reference.

- **Plan**: Coordination with other key working groups to understand issues and share lessons learned.

    - **Action:** NASA has formalized an Information and Data Management Program that will support the coordination of knowledge management standards and interfaces with other space organizations. Study Group Chair leads that area of the new program.
    - **Action:** NASA and U.S. Air Force are funding work to formalize an ontology for aerospace internationally. Meetings have been held with U.S. industry, ESA, U.S. government organizations, Airbus, Rolls Royce Aerospace to test validity of concept.
    - **Action**: U.S. Federal Knowledge Management Working Group has broadened it's membership to include those interested in government issues for knowledge sharing globally. This group will be identifying emerging standards in the KM area and best practices in the field, with a focus area on space-related organizations. These will be brought up as part of the IAA group discussions for any potential applicability.

- **Plan**: A position paper on the recommended approaches for an aerospace organization to follow in knowledge management that would promote knowledge sharing and interoperability with other organizations
    - **Action (delayed)**: Discussions have begun, paper has been outlined for draft review.

Study Team Member Changes?

- New members
    - Dr. Panagiotis Bamidis (Greece)
    - Dr. Roger Launius (US)
    - Dr. Sorosh Sorooshian, (US)
    - Mr. Stephan Ulamec (Germany)
- Online community to supplement working group—~135 members.

Name of Person Providing Study Group Status

- Jeanne Holm, Chief Knowledge Architect, NASA, Jet Propulsion Laboratory

Status Report Date

- 17 March 2009

Appendix 3
4.8: Space Systems Cross-Compatibility Study Group Status Report

Responsible Commission:
Commission 4.

Study Number and Title:
4.8: Space Systems Cross-Compatibility

Short Study Description
Common systems and standardization have been referred as “key words” in reducing space mission costs. NASA has experimented with these concepts for at least 35 years and implemented approaches for modular, standard components and interfaces with varying degrees of success. Interface definitions today have evolved considerably, and present a unique opportunity to effect cost reductions, in particular through the application of “plug-and-play” (PnP) principles. The IAA study group will focus on “Space System Cross-Compatibility” leveraging PnP interfaces, modularity and other concepts with a goal of reducing mission costs and increase international cooperation.
Among the numerous possibilities, systems that leverage these ideas promise to find application in Science, Exploration, Commerce, and other areas requiring cost reduction through fast system design, build, integration, test and flight.

Progress in past six months:
Meeting was held in Glasgow, with 12 participants in attendance. Minutes of the meeting are attached at the end of this report.

Website Study Information up to date?
Website needs to be updated.

Issues requiring resolution?
Except for the Study Group Chair (Jaime Esper), all other Study Group officials are not IAA members. Marco D’errico’s corresponding membership is currently in progress.
Request flexibility in official selection, as expertise may not be wholly contained within the IAA.
Schedule may need updating after May 2009. Depending on the results of this planned meeting, at the 7th IAA Symposium on Small Satellites for Earth Observation in Berlin, we may need to extend the final deliverable to 2011 in Berlin. This also depends on the membership, as it continues to fluctuate slightly. It is expected membership will be solidified during this meeting.

Product Deliveries on Schedule?
Product deliverables continue on schedule as defined in the SG proposal: First draft position paper in April (now May) 2009; Second Draft in September 2009; Final Paper in September 2010.

Study Team Member Changes?
Members listed in website do not have contact information. That is provided in this report.

Discontinue:
Kobayashi Chisato
Current email address UNKNOWN
Erin Kahn
Current email address UNKNOWN
Ray Williamson
rayw@gwu.edu

Name of person providing Study Group Status
Jaime Esper (CM2), Chair.

Status Report Date:
March 13, 2009.

Study Team Membership Changes
Effectivity Date: March 13, 2009

Appendix 4. 2009 Papers Submitted

42nd SYMPOSIUM ON SAFETY AND QUALITY IN SPACE ACTIVITIES

This Symposium organized by the International Academy of Astronautics addresses management approaches, methods, design solutions and regulations to improve the quality and efficiency of space programs. All aspects are considered: risk management, complexity of systems and operations, human factors, economical constraints, international cooperation, norms and standards.

Jeanne Holm, coordinator

D5.1. From Parts to Systems: Contribution of Tests on Performance Prediction and Assessment

During programs development tests are often major milestones. Several characteristics are to be outlined:

- The difficulty to valuably test a separate part of a complex system, furthermore when dealing with different states of technology maturity;
- The difficulty to simulate on ground the spaceflight conditions;
- The necessity to comply with standards and norms of various origins;
- The fact that tests are an important contributor to costs.

This session will address these various questions. It aims at contributing to the philosophy of test planning in quality plans for space program, and address as well experimental arrays, methods and norms. Lessons learned are welcome.

Manola Romero, chairman
Alexander Filatyev, chairman
Garett Smith, rapporteur

A Proposal to Improve the Reliability of the AOCS Software Based on Software Production Process
Dr. Ijar M. Da Fonseca <ijar@dem.inpe.br>
Instituto Nacional de Pesquisas Espaciais (INPE) – MCT

Creation Of The New Industry-Standard Space Test Of Laser Retroreflectors For GNSS, Fundamental Physics And Space Geodesy: The SCF-Test
Dr. Giovanni Delle Monache <dellemon@lnf.infn.it>
INFN-LNF

Drop Testing with the NASA Ames Hover Test Vehicle
Dr. Christopher Boshuizen <chris@chrisboshuizen.com>
Space Generation Advisory Council

Electrostatic Dust Hazard Prediction and Control for Lunar and Mars Missions
Dr. Wolfgang Sigmund <wsigm@mse.ufl.edu>
University of Florida

R&D project: SACER, a smart and autonomous wireless sensor's network.
Mr. Matthieu BARRAULT <matthieu.barrault@intespace.fr>
Intespace

Radiation Effects on the N-Channel IGBT
Prof. Young Hwan Lho <yhlho@wsu.ac.kr>
Woosong University

Simulated mission succes - real mission success
Mr. Leandro Hernandez Martin <leandro_hernan@yahoo.es>
University of Valladolid

Software-in–the-loop based end-to-end validation methodology for aerospace software development
Mrs. Prasada Kumari <pkks@isac.gov.in>
ISRO Satellite Centre

Testing the LARES Separation System
Prof. Isidoro Peroni <isidoro.peroni@uniroma1.it>
Scuola di Ingegneria Aerospaziale

The ensuring of an acceptable level of reliability and safety of launch system in “Soyuz at CSG” project
Dr. Vadim Kadzhaev <senchen@kbom.msk.ru>
Design Bureau of General Machine-Building (KBOM)

The seismometer challenge: How to test an instrument on Earth under Martian or Moon gravity?
Ms. Corinne Ségalas <segalas@ipgp.fr>
Centre National de La Recherche Scientifique (CNRS)

D5.2. Quality and Knowledge Management in Aerospace Companies

Working on complex space missions requires virtual teaming, learning lessons from the past, transferring knowledge from experts to younger generations, and developing deep expertise within an organization.

- How are aerospace companies managing the ability to control quality and share knowledge?
- What solutions are in place to work across corporate and international boundaries?
- How is knowledge captured, shared, and used to drive innovation?

This session focuses on the processes and technologies that companies (and agencies) are using to sustain, energize and invigorate their ability to learn, innovate, achieve quality and share knowledge.
Case studies and defined approaches will discuss:

- Analysis of successful projects and innovations in the application of quality and knowledge management
- Approaches to risk and opportunity management
- Capture of technical expertise and lessons learned from previous successful projects that are applicable to new programs and focus on driving innovation
- Solutions used for anomaly resolution and tracking systems, such as fault tree analysis and FMECA
- Failure recovery and preventative measures that relate to the application of quality and knowledge management practices.

Jeanne Holm, chairman
Roberta Mugellesi Dow, chairman

A Process of Code Inspection for Space Software
Mr. Marcos Romani <mromani@iae.cta.br>
Instituto de Aeronautica e Espaço (IAE)

A Refined Quality Control Method for Shenzhou-7 Manned Flight Mission

Mr. Jin yong <zhaozhigang077@yahoo.com.cn>
China Academy of Space Technology (CAST)

Apollo: Learning From the Past, For the Future
Mr. Michael Grabois <michael.r.grabois@nasa.gov>
United Space Alliance, LLC

Capturing Tacit Knowledge for Spacecraft Operations in ESOC
Ms. Roberta Mugellesi-Dow <Roberta.Mugellesi.Dow@esa.int>
European Space Agency (ESA)

Development and evaluation of a prototype cross-search system for aerospace technical data management
Mr. Yoshikazu Miyano <miyano.yoshikazu@jaxa.jp>
Japan Aerospace Exploration Agency (JAXA)

Learning from Space Operations: Lessons Learned as Drivers for Improvement
Mr. Stefano Scaglioni <stefano.scaglioni@esa.int>
European Space Agency (ESA)

Status of the IAA Knowledge Management Working Group
Mrs. Jeanne Holm <jholm@jpl.nasa.gov>
NASA/Jet Propulsion Laboratory

SWIFTER - Space Weather Informatics, Forecasting, and Technology through Enabling Research and Virtual Organizations
Mrs. Jeanne Holm <jholm@jpl.nasa.gov>
NASA/Jet Propulsion Laboratory

Taxonomy for Space: Knowledge Sharing Amongst Countries
Mrs. Jeanne Holm <jholm@jpl.nasa.gov>
NASA/Jet Propulsion Laboratory

The Implementation of Risk Management into the Concurrent Engineering Process
Mr. Andre Weiss <Andre.Weiss@dlr.de>
German Aerospace Center (DLR)

Knowledge Management for ESA’s Planetary Missions
Mr. G.H. Schwehm and Joe Zender, et al.
ESA-ESAC, Spain and The Netherlands

Understanding and Implementing Knowledge Management Applied to the ESA Rosetta Mission
Mr. V. Dhiri, G. Schwehm, and J. Brinkmann <viney.dhiri@sciops.esa.int>
ESA-ESAC, Spain

D5.3 Preventing Spacecraft Failure From Space Environment Effects

A better knowledge of the space environment and its effects on spacecraft is necessary to optimize design margins and avoid failures during space flight. The session will deal with: space environment and effects modelisation, standardisation in space environment and effects models, space weather prediction, lessons learned from in-orbit failures due to space environment.

Magdeleine Dinguirard, chairman

Tateo Goka, chairman

Fault-Tolerant Improvement on Kalman Filtering of Linear Stochastic System with Outliers in Sampling Process
Prof. Shaolin Hu <hshaolin@ustc.edu.cn>
University of Science and Technology of China

Influence of space weather on the geostationary satellite anomalies in the period 1997 – 2008
Mr. Ho-Sung Choi sky_stars@hanmail.net

KASI activities of space weather for satellite operation
Dr. KyungSuk Cho kscho@kasi.re.kr

Preliminary experiments for establishing an ESD ground testing method of satellite solar array
Prof. Kazuhiro Toyoda <toyoda@ele.kyutech.ac.jp>
Kyushu Institute of Technology

Projects for Spacecraft Materials in JAXA
Dr. Yugo Kimoto <kimoto.yugo@jaxa.jp>
Japan Aerospace Exploration Agency (JAXA)

Solar cell degradation monitored by Korean STSAT-1
Dr. Jaejin Lee jjlee@kasi.re.kr

Solar Energetic Particle Spectra during the Large Events of Solar Cycle 23
Dr. Junga Hwang <jahwang@kasi.re.kr>
Korea Astronomy and Space Science Research Institute

Space Environment Data Acquisition Equipment – Attached Payload (SEDA-AP) On The International Space Station - Japanese Experimental Module “Kibo” Exposed Facility
Mr. Kiyokazu koga koga.kiyokazu@jaxa.jp
JAXA

Space Weather Service in Korea
Dr. Sangwoo Lee <lee@spweather.com>
SELab, Inc.