Current SSA Activities in KOREA and KASI

Jang-Hyun Park
(Center for SSA/KASI)
독일 위성 추락 때 국제선 항공기 6대 운항 중단

지난 23일 추락한 독일 탈공위성 “폰트론” 때문에 한국에서 국제선 항공기 운항이 중단된 사태가 발생했다. 당시 폰트론 위성은 한국과 가까운 중국 보령에서 (Ţâmşo)에 추락할 가능성이 높아졌고, 한국항공우주산업(한항우)의 위험지역 지정에 따른 대비책이었다.

운항 중단된 항공기는 대한항공과 아시아나항공 6대를 포함한 한국의 항공사들이었다. 이들 항공사는 편성에 따라 화재를 발생시킨 위험성을 고려하여 운항 중단 결정을 내렸다. 전세계적으로도 이와 같은 사태가 발생한 경우를 볼 수 있었다.
Hazards from the Space: Asteroids
# National Preparedness Plan for Space Hazards

## VISION

- Safety and Protection from Space Hazards

## GOAL

- Prompt Action and Forecasting about Space Hazards
- Building up of National Space Hazards Monitoring System
- Enhancement of Preparedness Capability for Space Hazards

<table>
<thead>
<tr>
<th>Subject</th>
<th>Projects</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>System</strong></td>
<td>- Establishment and management of National Space Hazards Headquarters</td>
</tr>
<tr>
<td></td>
<td>- Designation and management of Space Environmental Monitoring Agency</td>
</tr>
<tr>
<td></td>
<td>- Establishment of Meteorite Management System</td>
</tr>
<tr>
<td><strong>Technology</strong></td>
<td>- Space risk identification and integrated analysis</td>
</tr>
<tr>
<td></td>
<td>- Monitoring and warning of potential Earth impactors</td>
</tr>
<tr>
<td></td>
<td>- Prediction of potential collisions between space objects</td>
</tr>
<tr>
<td></td>
<td>- Advanced system for solar activity monitoring</td>
</tr>
<tr>
<td><strong>Infrastructure</strong></td>
<td>- International cooperation to prepare in case of space hazards</td>
</tr>
<tr>
<td></td>
<td>- Research and development for technology</td>
</tr>
<tr>
<td></td>
<td>- Education for enhancement of Human resources</td>
</tr>
</tbody>
</table>
Plans for Space Hazards Monitoring

System
- All-sky surveillance complex camera
- OWL-Net
- Array Radar
- Ultra-wide field optical telescope
- 2m-class optical surveillance telescope
- Surveillance Radar
- Imaging Radar

OWL (Optical Wide-field Patrol), Electro-Optical Telescope System

KASI
Korea Astronomy & Space Science Institute
Space Objects Monitoring System

NEOs
Satellite conjunction
Reentries
Meteors

Meteor monitoring network
Array radar
All-sky surveillance camera
Imaging radar

KASI (Korea Astronomy & Space Science Institute)
KASİ Introduction

- Korea Astronomy & Space Science Institute
  - Founded in 1974 as a national observatory
  - Government affiliated institute
  - 3 Research divisions and 4 centers
  - Human Resources:
    - research staffs ~ 180
    - engineers ~ 30
    - administration ~ 90
    - students ~ 40
  - Budget FY2014
    - total ~ 66 M USD
    - research ~ 43 M USD
KASI Introduction
SSA Activities in KASI

• Dedicated institute for SSA in Korea
  – Korean government selected KASI as a specialized organization for SSA

• Center for SSA
  – Optical tracking facilities: OWL-Net (Optical Wide-field patroL Network)
  – Optical surveillance of the GEO belt covering Korean peninsula
  – Orbit team: precise orbit determination & analysis, reentry research
  – Preparing radar facilities (array radar, passive radar, etc)

• NEO related Activities
  – Asteroid research team: physical characterization of asteroids and comets
  – Meteoroids trajectory analysis
  – UN COPUOS Action Team 14 participation

• Space Weather related Activities
  – Heliophysics research group: Solar observation and CME research
  – Observation of earth’s magnetosphere & ionosphere, space weather forecast
OWL-Net Introduction

• Introduction
  – OWL-Net : Optical Wide-field patroL Network
  – Selected as one of Korean NAPs in Nov. 2010 and started from Dec. 2010
  – NAP (National Agenda Project) :
    There is no means for surveillance and tracking of space objects
  – Total budget : ~ $17M (6 year)

• Main Objectives
  – Optical tracking of Koran LEO satellites
  – Optical surveillance of the GEO belt covering Korean peninsula

• Design Concepts
  – Wide-field telescopes, Multi-site observation
  – Single shot/multi-points : a network of digitalized Bake-Nunn camera
  – Robust robotic observatory for easy maintenance
  – Tracking Accuracy ~ 5 arcsec
## OWL System: Telescope

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value/Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mirror aperture</td>
<td>0.5m</td>
</tr>
<tr>
<td>Optics type</td>
<td>Richey-Cretian</td>
</tr>
<tr>
<td>Field of View</td>
<td>1.1 deg x 1.1 deg</td>
</tr>
<tr>
<td>Plate Scale</td>
<td>0.98 arcsec/pixel</td>
</tr>
<tr>
<td>Mount type</td>
<td>Alt-Az</td>
</tr>
<tr>
<td>Mount speed</td>
<td>10 deg/sec</td>
</tr>
<tr>
<td>Mount acceleration</td>
<td>2 deg/sec²</td>
</tr>
</tbody>
</table>
Telescope back-end: Wheel Station

- Chopper
- Filter wheel
- Derotator
- CTR
- Embedded PC
  - CCD
  - Shutter
- CCSL
- Derotator

OWL
Optical Wide-field Patrol

KASI
Korea Astronomy & Space Science Institute
• HQ: OWL network control
  – PPF, TPF, OCF generation
  – Site and telescope status monitoring

• SOS: Site control
  – OCF management,
  – observation/status data transmission
  – Telescope, detector, dome control
OWL-Net Sites
Test Observation (Test bed in Korea)

KOMPSAT-1 (13.09.25. 05:37 KST)  
STSAT-1 (13.09.25. 05:37 KST)
Test Observation (Mongolian Station)

A2014061706012_0003
Target: Envsat_F27386
Expo: 4.147 s, FWHM H: 5.7, V: 5.8
Local date & time : 2014-6-17 23:19:33

A2014061706023_0003
Target: KOMPSAT-2_K000005
Expo: 3.478 s, FWHM H: 4.0, V: 3.7
Local date & time : 2014-6-18 01:20:31
ATV-5 Campaign

Mongolian Station (15/02/2015)
USA 234 Satellite (30/09/2013, 4 shots, total 4 min exposure, ~ 120pts)
Thank you!!