AMOS

Advanced Maui Optical and Space Surveillance Technologies Conference

Program

September 13-16, 2011 | Maui, Hawai‘i

A program of Maui Economic Development Board, Inc.
Welcome all!

We are pleased that you are participating in the 12th AMOS Conference. Although we will be sitting in a darkened ballroom, intently listening to technical briefings throughout the week, we are, indeed, in a culturally rich and beautiful setting…

It is our pleasure to share with you a few of the things that make Maui unique. We have sprinkled elements throughout the week to remind us of our Hawaiian “Sense of Place.”

Among them are the lei kukui worn to designate our conference session chairs, our traditional Native Hawaiian invocation opening the conference, and a private luau buffet and show on Wailea Beach.

If there is anything our Conference Team can do to make your week more productive and enjoyable, please let us know.

Warmest Aloha,
The AMOS Conference Organizing Committee
Mahalo to our Sponsors

Poʻokela (striving for the best)

BOEING

Laulima (working together)

Orbital
Innovation You Can Count On®

Lōkahi (collaboration and unity)

agi
BAE SYSTEMS
Raytheon
SPACE FOUNDATION

Kupaʻa (loyal and committed)

INTEGRAL SYSTEMS
LOCKHEED MARTIN
NORTHROP GRUMMAN

Mālama (to care for)

AFRL
AO Applied Optimization
ISS Intelligent Software Solutions
Radiant Blue Technology
ATA Applied Technology Associates
SpaceNav
**Pō‘akolu | Wednesday, Sep 14**

6:00-7:15 AM  **BREAKFAST AT LEISURE** | Luau Gardens

7:30-6:00 PM  **EXHIBITION AND POSTER ROOM** | Jade-Plumeria Ballroom

7:30 AM  **CONFERENCE OPENING** | Aulani Ballroom

Jeanne Unemori Skog, President & CEO, Maui Economic Development Board

NATIONAL ANTHEM AND HAWAI‘I PONO‘I

TSgt Tamiko Boone, U.S. Air Force Band of the Pacific

INVOCATION

Reverend Kealahou Alika, Keawala‘i Congregational Church

WELCOME REMARKS (via video)

Daniel K. Inouye, United States Senator

**KEYNOTE ADDRESS**

Introduction

Colonel L. Kirk Lewis, Ret., Senior Analyst, Institute for Defense Analyses


9:10  **BREAK**

Welcome Coffee Hour for Spouses and Guests | Mala Lounge (9:00 AM)

9:30  **BELTWAY OPTICS–THE IMPACT OF POLITICS ON SPACE POLICY**

Brendan Curry, Vice President-Washington Operations, Space Foundation

10:00  **SPACE SITUATIONAL AWARENESS**

Session Chair: Lt Col Jim Shell, Space Innovation & Development Center, USAF

Space Based Space Surveillance (SBSS) System: Delivering Unprecedented Space Situational Awareness

Lt Col Stephen Behm, Space Superiority Systems Directorate

Adding the Local Layer to the SSA Picture

Kipp Johnson, Scitor Corporation

Internal JSpOC SSA processing

Col Michael Wasson, JSpOC

11:00  **LUNCHEON** | Lokelani Ballroom

Co-sponsored by BAE Systems

12:00 PM  **SPACE SITUATIONAL AWARENESS** (continued)

DREAM: An Integrated Space Radiation Nowcast System for Natural and Nuclear Radiation Belts

Geoffrey Reeves, Los Alamos National Laboratory

Space Domain Awareness

Lt Col Travis Blake, DARPA/TTO – Space Systems

BMDS SSA Integrated Sensing Demonstration (BISD)

Terje Turner, Aerospace Corporation
1:00 PM
Unique Search and Track Procedures Utilizing the GEODSS Worldwide Sites
Kenneth Grant, BAE Systems

Space Fence PDR Phase Program Overview
Phillip Phu, MIT LL

SSA Capability Improvements
Hans Thatcher, HQ AFSPC, Directorate of Requirements

Joint Space Operations Center (JSPOC) Mission System (JMS)
Maj Michael Morton, HQ AFSPC, Directorate of Requirements

2:20 BREAK

2:40 NON-RESOLVED OBJECT CHARACTERIZATION
Session Chair: Matt Hejduk, a.i. solutions (AFSPC/A9A)

Use of Light Curve Inversion for Non-Resolved Optical Detection of Satellites Performing On Orbit Servicing in GEO
Lauchie Scott, Defense R&D Canada - Ottawa

Cylindrical RSO Signatures, Spin Axis Orientation and Rotation Period Determination
Phil Somers, Royal Military College of Canada

Toward Realistic Dynamics of Rotating Orbital Debris and Implications for Lightcurve Interpretation
Gregory Ojakangas, Drury University

AMOS Galaxy 15 Satellite Observations and Analysis
Doyle Hall, Boeing LTS Maui

4:00-6:00 EXHIBITION RECEPTION AND POSTER PRESENTATIONS | Jade-Plumeria Ballroom
Reception Co-sponsored by Analytical Graphics, Inc.

5:00-6:00 AMOS SITE CAPABILITIES TUTORIAL | Aulani Ballroom
Virginia Wright, Air Force Research Laboratory

5:30-6:30 NEW GENERATION NETWORKING RECEPION | Kaho'olawe Lawn
Sponsored by the Space Foundation (by invitation only)

8:00-10:00 PM AN EVENING UNDER THE STARS WITH ORBITAL | Pacific Terrace Rooftop
DESSERT RECEPION
Sponsored by Orbital Sciences Corporation

Hōʻiʻeke Poʻakolu (highlights of the day)

WELCOME COFFEE HOUR FOR SPOUSES AND GUESTS
Non-registered partipants are invited to an informal presentation about optional island activities. This is a nice opportunity to mingle and map out plans for the week. Mala Lounge at 9:00 a.m.

EXHIBITION RECEPTION AND POSTER PRESENTATIONS
Co-sponsored by Analytical Graphics, Inc, the poster session is an opportunity for authors to present their work and have in-depth discussions with conference participants. Poster display boards are arranged throughout a portion of the ballroom together with industry exhibits in a convivial setting with seating and light refreshments to encourage interaction with the poster authors. The exhibit venue is open throughout the week serving as a locus for side discussions and pop-up meetings.

AMOS SITE CAPABILITIES TUTORIAL
The Maui Space Surveillance Complex (MSSC), located at the summit of Haleakala, is a national resource providing support to various government agencies and the scientific community. The tutorial summarizes MSSC systems, capabilities, and support procedures and includes a description of the telescopes and sensors. It will also include a brief overview of the Maui High Performance Computing Center (MHPCC).
6:00-7:15 AM  BREAKFAST AT LEISURE  | Luau Gardens
7:30-6:00 PM  EXHIBITION AND POSTER ROOM  | Jade-Plumeria Ballroom
7:30 AM  AMOS AND THE UNIVERSITY OF HAWAII: The Intersection of Science, Research and Education  | Aulani Ballroom
M.R.C. Greenwood, President, University of Hawai‘i
8:00  NON-RESOLVED OBJECT CHARACTERIZATION  (continued)
- Fingerprinting of Non-resolved Three-axis Stabilized Space Objects Using a Two-Facet Analytical Model
  Anil Chaudhary, Applied Optimization, Inc.
- Understanding Satellite Characterization Knowledge Gained from Radiometric Data
  Andrew Harms, Air Force Research Laboratory
- Specular and Diffuse Components in Spherical Satellite Photometric Modeling
  Matt Hejduk, a.i. solutions
- Measurement of the Photometric and Spectral BRDF of Small Canadian Satellites in a Controlled Environment
  Maj Donald Bedard, Royal Military College of Canada
9:20  BREAK
9:40  OPTICAL SYSTEMS
  Session Chair: Lt Col Travis Blake, DARPA/TTO – Space Systems
  Mike Dearborn, USAF Academy
- Status of Telescope Fabra ROA Montsec Optical Observations for Space Surveillance & Tracking
  Octavi Fors, Departament d’Astronomia i Meteorologia, Institut de Ciencies del Cosmos (ICC), Universitat de Barcelona (IEEC-UB)
- The HANDS-IONS Daytime Camera for GEO Satellite Characterization
  Kevin Jim, Oceanit Laboratories, Inc.
- FalconSAT-7: A Photon Sieve Space Telescope,
  Geoff Andersen, USAF Academy
11:00  LUNCHEON  | Lokelani Ballroom
12:00 PM  SPACE DEBRIS OBSERVATION STATUS AND NEEDS
  Moderator
  David Finkleman, Center for Space Standards and Innovation, Convenor, ISO Space Operations Working Group
  Panel Members
  - Patrick Seitzer, University of Michigan
  - Yukihito Kitazawa, IHI Corporation
  - Daniel Oltrogge, Center for Space Standards and Innovation & Space Data Corporation
  - Craig Smith, EOS, Australia
1:00  ORBITAL DEBRIS
  Session Chair: Eugene Stansbery, NASA-JSC
  Pan-STARRS Status & Geo Observation Results
  Mark Bolden, AFRL/RDSME
  A Search for Optically Faint GEO Debris
  Patrick Seitzer, University of Michigan
  Effective Search Strategy Applicable for Breakup Fragments in the Geostationary Region
  Toshiya Hanada, Kyushu University
2:00 PM  ORBITAL DEBRIS (continued)
A New Orbital Analyst Tool for Associating Un-cataloged Analyst Debris with Historical Launches, Breakups, and Anomalous Events
Bruce Bowman, AFSPC / A9
Commercially-Hosted Payloads for Debris Monitoring and Mission Assurance in GEO
Lt Col Jim Shell, US Air Force

2:40 BREAK

3:00 SPACE-BASED ASSETS
Session Chair: Seth Harvey, Air Force Research Laboratory
Benefits of Hosted Payload Architectures for Improved GEO SSA
Implementation of a Ka-Band Communication Path for On-Orbit Servicing
Ralf Purschke, Institute of Astronautics, Technical University of Munich
An Investigation into Using Differential Drag for Controlling A Formation of CubeSats
Matthew Horsley, Lawrence Livermore National Laboratory

4:00-5:00 EXHIBITION AND POSTER RECEPTION | Jade-Plumeria Ballroom
Reception Co-sponsored by SpaceNav

5:30-6:30 THE FUTURE OF UTC AND THE LEAP SECOND | Mauna Loa Room
David Finkleman, Center for Space Standards and Innovation

Hōʻike Pōʻaha (highlights of the day)

PAU HANA RECEPTION
Co-sponsored by SpaceNav, visit the exhibit venue for a SpaceNav “Stinger” cocktail to kick off your evening.

SPACE IN THE CLASSROOM at the AMOS Conference

Student Workshop on Sept. 15
Teacher Workshop on Sept. 16

In association with
Air Force Research Laboratory (AFRL)
Alaka‘ina Foundation’s Digital Bus Program
Analytical Graphics, Inc. (AGI)
The Boeing Company
Institute for Astronomy, University of Hawaiʻi (IfA)
Lockheed Martin
Maui High Performance Computing Center (MHPCC)

Co-sponsored by
Northrop Grumman
Orbital
Pacific Defense Solutions (PDS)
United Launch Alliance (ULA)
Special Thanks
Presentation Services Audio Visual (PSAV)
Wailea Beach Marriott Resort & Spa
Poʻalima | Friday, Sep 16

6:00-7:15 AM  BREAKFAST AT LEISURE  | Luau Gardens

7:30-4:20 PM  EXHIBITION AND POSTER ROOM  | Jade-Plumeria Ballroom

7:30 AM  FUTURE DIRECTIONS FOR COLLABORATIVE SSA  | Aulani Ballroom

Moderator
Lt Gen Michael A. Hamel, USAF (Retired), Senior Vice President, Strategy and Development, Orbital Sciences Corporation

Panel Members
- Maj Gen Jay Santee, Principal Director, Space Policy, Office of the Under Secretary of Defense for Policy
- Col Stephen Butler, Chief, Space Situational Awareness & C2, USAF
- Richard DalBello, Vice President Legal and Government Affairs, Intelsat General
- Paul Graziani, Chief Executive Officer, Analytical Graphics, Inc.

9:00  BREAK

9:20  ASTRODYNAMICS

Session Chair: Paul Cefola, University at Buffalo (SUNY)

The All-Versus-All LEO Conjunction Problem
Arthur Lue, MIT Lincoln Laboratory

A High Performance Conjunction Analysis Technique for Cluster and Multi-Core Computers
Eric George, The Aerospace Corporation

An Application of Hadoop and Horizontal Scaling to Conjunction Assessment
Michael Prausa, The MITRE Corporation

Efficient All-vs-All Collision Risk Assessment
Miguel Molina, GMV Aerospace and Defence, S.A.

Maneuver Optimization through Simulated Annealing
Willem de Vries, Lawrence Livermore National Laboratory

11:00  LUNCHEON  | Lokelani Ballroom

12:00 PM  ASTRODYNAMICS (continued)

Reconciling Covariances with Reliable Orbital Uncertainty
Zachary Folcik, MIT Lincoln Laboratory

Demonstration of the DSST State Transition Matrix Time-Update Properties Using the Linux GTDS Program
Paul Cefola, University at Buffalo (SUNY)

Orbit Determination and Data Fusion in GEO
Joshua Horwood, Numerica Corporation

1:00  ADAPTIVE OPTICS AND IMAGING

Session Chair: Capt Casey Pellizzari, Air Force Research Laboratory

Comparison of Turbulence-Induced Scintillations for Multi-Wavelength Laser Beacons Over Tactical (7 km) and Long (149 km) Atmospheric Propagation Paths
Mikhail Vorontsov, University of Dayton

Inverse Synthetic Aperture LADAR for Geosynchronous Space Objects: A Signal-to-Noise Analysis
Capt Casey Pellizzari, Air Force Research Laboratory, Det 15

Compact Multi-Channel, Multi-Frame, Blind Deconvolution
Douglas Hope, Institute for Astronomy, University of Hawaii

2:00  BREAK

2:20  Multi-Frame Myopic Deconvolution for Imaging in Daylight and Strong Turbulence Conditions
Stuart Jefferies, HartSCI LLC
2:40 PM  ADAPTIVE OPTICS AND IMAGING (continued)
Laser Guide Star Radiometry From Several Off Axis Locations
Richard Tansey, Lockheed Martin

Holographic Adaptive Laser Optics System (HALOS)
Geoff Andersen, USAF Academy

Quantifying Atmospheric Impacts on Space Optical Imaging and Communication Systems
Randall Alliss, Northrop Grumman Corporation

Interferometric Imaging of Geostationary Satellites: Signal-to-Noise
Anders Jorgensen, New Mexico Tech

4:00  CONFERENCE ADJOURN

POSTER AND EXHIBITOR DISMANTLE

5:30-8:30 PM  CLOSING DINNER AND SHOW | Luau Gardens

Hōʻike Pōʻalima (highlight of the day)

Aloha Friday Dinner & Show

Set against the backdrop of the Pacific Ocean, the conference wraps up with a closing dinner and concert by Maui's own, Willie Kahaiali'i. Entertaining audiences all over the world, Willie K's portfolio spans four decades. From Opera to Rock, Hawaiian to Blues and more, his music is guaranteed to bring you to your feet. There's only one way to prepare for Willie K—expect the unexpected. Ticket required for entry.

Pōʻaono | Saturday, Sep 17

OPTIONAL AMOS TECHNICAL TOUR | Departs from Wailea Marriott at 7:30 & 9:30 AM

Beginning at sea level, the tour will proceed to the 10,000 ft. summit of Haleakala for a visit to the Maui Space Surveillance Site where participants will visit the DoD's 3.6m AEOS telescope and Pan-STARRS at the UH Institute for Astronomy. Transportation and lunch will be provided for the approximately seven hour trip.
The Air Force Maui Optical & Supercomputing Site (AMOS) consists of two facilities that are used together to conduct SSA R&D.

The RISB Visualization team is collaborating with RISA’s Space C2 team has established a cross directorate collaborative display with the RD directorate at the 12th Annual AMOS Conference.

AGI delivers mission-proven software for timely and cost-effective development and deployment of advanced space, defense and intelligence applications. Scalable Display Technologies produces groundbreaking software that automatically calibrates and edge-blends multiple projectors into seamless digital displays.

Applied Optimization, Inc. (AO) operates three telescope sites in Dayton, OH and develops mathematical algorithms for non-Resolved Object Characterization.

A-Tech Corporation, d.b.a. Applied Technology Associates (ATA) is a precision measurement, sensing and controls company providing services and products to government and commercial customers.

Astro Haven Enterprises (AHE) manufactures clamshell dome shaped fiberglass enclosures for optical, radar and other tracking instrumentation.

BAE Systems is a global defence and security company with approximately 100,000 employees worldwide. The Company delivers a full range of products and services for air, land and naval forces, as well as advanced electronics, security, information technology solutions and support services.

Boeing is the world’s largest aerospace company and leading manufacturer of commercial jetliners and defense, space and security systems.

Come see the latest from FLIR Systems, the global leader in infrared cameras. FLIR will feature its SC Series infrared cameras which boast high speed, high resolution, and high sensitivity.

Northrop Grumman Corporation is a leading global security company whose 75,000 employees provide innovative systems, products, and solutions in aerospace, electronics, information systems and technical services to government and commercial customers worldwide.

Santa Barbara Focalplane, a Lockheed Martin Missiles & Fire Control Business, is a world leader in the design, customer development and manufacture of multi-spectral infrared focal plane array detectors and complete infrared imaging systems.

Oceanit’s HANDS program is an Air Force program that successfully built and deployed a worldwide network of optical ground stations to provide timely information about space objects.