SHORT COURSE SCHEDULE – AMOS 2017

Tuesday 19 September

8:00 AM - 12:00 PM **TECHNICAL SHORT COURSES 1, 2 & 3**
(Separate registration fee required for each course)

1 Collision Avoidance Risk Assessment
Presented by:
Francois Laporte and Monique Moury, CNES
Matt Hejduk and Lauri Newman, NASA/GSFC

The threat of on-orbit collisions has become an increasing concern to the space faring community, both as increasing mission risk and awareness of the problem. The operational practice of conjunction assessment in response to this risk has also become more commonplace, evolving from simply predicting close approaches between orbiting objects to sophisticated systems and processes for managing on-orbit collision risk. This short course, organized and taught by industry leaders and subject matter experts in the field, is designed to educate beginners to intermediate-level practitioners on the fundamentals of conjunction assessment, and aims at making participants conversant in the theoretical underpinnings and operational practices of conjunction assessment. The course is an update and expansion on the 2016 short course, presenting the role and methods of NASA CARA (Conjunction Assessment Risk Analysis) and CAESAR (Conjunction Assessment and Evaluation Service: Alerts and Recommendations.) Altogether, around 70 satellites are concerned by CARA and/or CAESAR. Both processes regularly evolve in order either to follow JSpOC upgrades or to improve analysis according to experience acquired during the past years.

2 Rapid Integration of Novel Algorithms with Modern Data Management Systems
Presented by:
Carl Fischer, Chief Technologist, Ball Aerospace
Matthew Fisher, Senior Engineer, Ball Aerospace

The Space Surveillance community will benefit from a transition path that reduces the time and costs necessary to prototype and integrate new algorithms into Space Surveillance systems. Overall system capabilities will advance more quickly once novel algorithms can be evaluated more quickly and integrated at lower cost. Modern big-data architectures achieve this rapid innovation by exposing their data to a broad community of potential partners with standards-based interfaces to the data and data-models.

During this course, participants will learn the key components of these modern software architectures and how to integrate with such systems. We will focus on CoreTek as our reference architecture. CoreTek is an event-driven architecture (EDA) developed by Ball Aerospace under a government-use license and is comprised of open-source technologies such as: Postgres, Django, Celery, and RabbitMQ. Practical exercises will be provided to the participants which will require a working knowledge of the Python programming language. Course is "hands-on," participants should bring their own laptop. At the end of the short course, participants will demonstrate their skills by designing, implementing, and integrating a simple change-detection algorithm for notional time-varying scalar signatures. Course will cover what Coretek is under the hood, how programs interact with Coretek, how to visualize your tool outputs in the architecture and how to implement monitoring features such as change detection.

8:00 AM - 12:00 PM **TECHNICAL SHORT COURSES 1, 2 & 3 (Cont.)**

3 Earth and Planetary Atmospheric Physics Primer
Presented by:
Capt Michael Nayak, AFRL/RDSMR

This course will be of interest to scientists or engineers who work in Space Situational Awareness and either need a primer on atmospheric dynamics and physics to support their analysis, or need to gain a basic understanding of the complexities involved in imaging or radiating through the atmosphere. It will provide an introduction into the use of remote-sensing observations and modeling to obtain a quantitative understanding of the structure, dynamics, composition and evolution of planetary atmospheres. Topics to be covered include atmospheric basics, energy balance, atmospheric composition and chemistry, basics of radiative transfer, atmospheric dynamics and quantitative introduction to planetary (non-Earth/exoplanet) atmospheric physics.

1:00 PM - 5:00 PM **TECHNICAL SHORT COURSES 4 & 5**
(Separate registration fee required for each course)

4 Space Debris Risk Assessment and Mitigation Analysis – Requirements and their verification using ESA's DRAMA software
Presented by:
Vitali Braun, Space Debris Engineer, IMS Space Consultancy at ESA/ESOC Space Debris Office
Tim Flohrer, Space Debris Analyst, SST Segment Co-Manager, ESA/ESOC Space Debris Office

For more than twenty years, the Inter-Agency Space Debris Coordination Committee (IADC), which is represented by space agencies from thirteen member states, has been coordinating space debris mitigation activities. IADC guidelines were the basis for space debris mitigation requirements that became applicable to space missions, e.g., conducted by NASA or ESA, but also found their way into national space law, for example in France. In order to verify that requirements are met, the agencies almost entirely rely on the use of qualified tools. In view of the increasing number of parties involved in launching and operating spacecraft, qualified tools establish the means to assess the mitigation-related aspects of the mission design in an early project phase and to compare them to results obtained for other missions and designs.

The objective of this course is to provide an elementary introduction to ESA's corresponding tools that are provided as a collection in the Debris Risk Assessment and Mitigation Analysis (DRAMA) tool suite. It will enable the participants to perform the required mitigation and risk analyses in order to verify the compliance of mission scenarios with space debris mitigation requirements. DRAMA is available from ESA for users worldwide subject to a registration, and free of charge.

5 Implementing Operational Analytics using Predictive Analysis and Big Data Techniques
Presented by:
Rohit Mital, Chief Technology Officer, Stinger Ghaffarian Technologies
Joseph Coughlin, Senior Systems Engineer, Stinger Ghaffarian Technologies

Operators and analysts are being overwhelmed with the amount of potential data available from both existing and new classes of sensors. When multiple sensors are combined in a network, the magnitude of the data becomes too great to analyze by conventional means. Since AMOS participants are often at the forefront of new technologies, the application of Operational Analytics and Predictive techniques toward current and future sensors may be critical. This short course will walk through both a potential methodology and an overview of current technologies for aspiring or current users to utilize Operational Analytics in their exploitation of existing data as well as building future architectures.