International Committee on
Global Navigation Satellite Systems

Summary Report - FINAL

ICG Workshop on GNSS Interference Detection and Mitigation Hilton Waikiki Beach, 2500 Kuhio Avenue, Honolulu HI 96815 Monday, 15 April. Location/Room: Prince Jonah

Introduction

The International Committee on Global Navigation Satellite Systems (ICG) Working Group on Systems, Signals and Services (WG-S) conducted the 11th GNSS Interference Detection and Mitigation (IDM) workshop under the efforts of the IDM Task Force. The workshop was conducted at the venue where the Institute of Navigation (ION) Pacific Position, Navigation and Timing (PNT) Conference was hosted in the Hilton Waikiki Beach in Honolulu, HI during April 15, 2024.

The 11th IDM Workshop provided stakeholder participants opportunities to join in-person as well as virtually during the workshop event. The Executive Secretariat of the International Committee on Global Navigation Satellite Systems (ICG) United Nations Office for Outer Space Affairs (UNOOSA) extended the formal invitation to the world GNSS stakeholder community and provided the opening remarks along with the Approval of the final Agenda.

Workshop Topic Briefings

The 11th IDM Workshop featured a number of important topics and briefings providing the international audience of stakeholders with awareness and progress on initiatives, projects, and concepts related to the overall mission of Interference, Detection and Mitigation (IDM) in the Space-Based GNSS service delivery.

The workshop started with the first topic presented by Mr. Bryan Chan, Co-Founder, XONA Space Systems, on PNT from Low Earth Orbit. The Xona team completed presenting a very important aspect of the overall IDM mission as it relates to commercial and government quick acceleration of LEO PNT developments. Xona correlated on the opportunities that LEO PNT will provide for enhanced resilience accuracy, and security. The greatest LEO Technology development at present is driven by commercial and government needs for resiliency.

The second topic of the workshop was presented by Mr. Iain Goodridge, Senior RFGL products with the SPIRE Federal Space Systems team. The topic was related to SPIRE implementation of GNSS Interference Detection from Low Earth Orbit. SPIRE presented how Space-based GNSS interference monitoring has the potential to offer continuous global situational awareness and interference characterization. An example of the SPIRE Dual-Satellite Capture techniques was presented. The Spire Frequency Collection Bands include the bands beyond L-Band to include the S, X, Ku and Ka bands. SPIRE completed they topic with their Data Access Options for archived daily collects, custom Areas of Interest (AOI) and dedicated constellations assets for persistent RF surveillance in the GNSS band and eventually spanning to others RF bands.

The third workshop topic was presented by Dr. Steve W. Lewis, Chief Engineer at the Aerospace Corporation leading the Joint Commercial Operations under the United States Space Command. The

JCO participating teams leverage the Data Exploitation and Enhance Processing (DEEP) program for the collection of observables effects in the space layer assets in numerous proliferated constellations. The Aerospace Corporation team presented additional efforts and initiatives to stand up the workforce of analysts in the IDM domain with the establishment of the Spectrum EMI, Awareness, and Response (SPEAR) Team. The Aerospace Corp team provided overviews on initiatives in PNT Situational Awareness, Mission Assurance Toolkit, data curation, and contingency back-up capability to enable advancement and enhancement of PNT Situational Awareness capabilities. The final section of the topic informed the audience of training efforts for the analysts performing duties at the JCO environment.

The fourth topic of the IDM workshop was presented by Mr. James S. Aviles, Senior RF National Engineer at the Department of Transportation (USDOT). The United States Department of Transportation presented to the international workshop stakeholders the strategic plans the department of transportation is implementing in collaboration with other US Federal government departments, states and industry to meet nine IDM high level requirements described in the Space Policy Directive signed by the President of the United States in January 2021. The US DOT material informed the IDM workshop participants of the existing manual Concept of Operations and the goal to augment this process with advance automation tools and distributed sensor systems. Examples of real-world events impacting transportation segments dependent on GNSS services included the surface, maritime, aeronautical and critical fixed ground infrastructure that supports all other transportation segments. USDOT also presented the partnership efforts with the USDOD Defense Innovation Unit (DIU) under the Harmonious Rook program for developing Machine Learning (ML) and Artificial Intelligence (AI) to process GNSS anomalous observables for geolocation estimates of potential interference sources.

The fifth topic of the IDM Workshop was a combined briefing presented by Ms. Christina Clausnitzer, Program Analysts under the US DOT Federal Aviation Administration (FAA) Office of Safety Standards and Mr. Kenneth Alexander, Chief Scientist and Technical Advisor for US DOT FAA Satellite Navigation Systems. Ms. Clausnitzer covered the US FAA delivery of PNT Resiliency initiatives in the aviation sector at the European Union Aviation Safety Agency (EASA) hosted workshop on January 25, 2024 in Cologne, Germany. The growing safety concerns in aviation due to Global Navigation Satellite System (GNSS) jamming and spoofing was presented to the ICG stakeholder community. FAA informed on the collaborative efforts in Germany to foster a deeper understanding of the challenges and development of strategies to address the current global GNSS interference situation. Mr. Alexander covered the second part of the combined presentation related to the International Civil Aviation Organization (ICAO) Radio Navigation Symposium held in Antalya, Türkiye, on 6-8 February 2024. One key objective of the Symposium was to discuss GNSS vulnerabilities management plan and possible GNSS jamming/spoofing monitoring solutions. A future path for Complementary PNT was presented for Aircraft Flight Management System with Navigation Integration for "improved consideration of all sources". The joint briefing concluded with the extensive number of ICAO recommendation as a result of the Symposium.

The six and final topic of the IDM Workshop was presented by Professor Dr. Renato Filjar, with the Laboratory for Spatial Intelligence, Krapina University of Applied Sciences University of Rijeka, Rijeka, Croatia. Dr. Filjar provided extensive research work the University of Rijeka has been conducting in the focused area of Ambient-Aware Position Navigation and Timing. Dr. Filjar informed the ICG stakeholders of numerous advancements in today's technology development are not been exploited in full for PNT situational Awareness. These are in the areas of: (i) Software Defined Radio, (ii) statistical & machine learning, artificial intelligence, (iii) computational capacity of mobile devices, (iv) mobile platforms with SDR GNSS receivers & embedded sensors

(smartphones, connected vehicles, IoT devices, etc.), (v) open access to position environment data in near-real time (space weather, geomagnetic, and ionospheric indices, spatial databases etc.), and (vi) mobile internet and IoT devices. For each major area of possible leverage, Dr. Filjar presented the Ambient-Aware research approach as tools in the toolkit for IDM capabilities. Four major recommendations completed the Ambient-Aware topic to conclude the workshop.

Workshop Recommendations

The 11th IDM Workshop completed the important topics and briefings for the Spring of 2024 providing the international audience and GNSS stakeholders with awareness and progress on initiatives, projects, and concepts related to the overall mission of Interference, Detection and Mitigation (IDM) in the Space-Based GNSS service delivery. Thee major recommendations were listed as part of the conclusion of the workshop. These are the following:

1) IDM As a Global Capability Recommendations for WG-S consideration
2) IDM Workshop Benefits to the larger ICG community
3) IDM Workshop Next Steps
   a) ICG Secretariat IDM Workshops
   b) Location for next IDM workshop

Conclussion

The 11th IDM Workshop adjourned at 1630 Hawaii local time after the questions and answers open session to all participants and with the consensus of the Co-Chairs of the ICG WG-S. The agenda and proceeding of the 11th IDM Workshop and those of past history sessions can be accessed at the following website:

https://www.unoosa.org/oosa/en/ourwork/icg/working-groups/s/IDMIndex.html