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International - Aerial Measuring System (I-AMS) Training Program

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Abstract: The Office of International Emergency Management and Cooperation (IEMC) at the U.S. Department of Energy, National Nuclear Security Administration (DOE/NNSA) sponsors an International - Aerial Measuring System (I-AMS) training program for partner nations to develop and enhance their response to radiological emergencies. An initial series of courses can be conducted in the host country to assist in developing an aerial detection capability. As the capability develops and expands, additional experience can be gained through advanced courses with the opportunity to conduct aerial missions over a broad range of radiation environments.

1. Introduction

Since the Fukushima reactor accident in 2011, there has been an increased interest worldwide in developing national capabilities to rapidly map and assess ground contamination resulting from nuclear reactor accidents. The capability to rapidly measure the size of the contaminated area, determine the activity level, and identify the radionuclides can aid emergency managers and decision makers in providing timely protective action recommendations to the public and first responders. The development of an aerial detection capability requires interagency coordination to assemble the radiation experts, detection system operators, and aviation aircrews to conduct the aerial measurements, analyze and interpret the data, and provide technical assessments.

2. I-AMS Basic Course

The I-AMS Basic Course is a three-day course conducted in the host country. The host country coordinates the interagency participation and provides access to an aircraft, typically a helicopter, and obtains airspace approval for training flights. The course consists of classroom lectures on mission theory and operation, measurement techniques, detection equipment operation, and aerial mission planning. Aerial detection equipment is provided and demonstrated and the participants receive hands-on training to set up, calibrate, and operate the system.

Although there are a variety of aerial detection systems being used worldwide, the IEMC program uses the DOE-developed Spectral Advanced Radiological Computer System (SPARCS), which is a versatile radiation detection and acquisition system that can be readily

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installed in rotary- and fixed-wing aircraft. The SPARCS system consists of a detector pod, a data acquisition unit, and a laptop computer. Typically a two-person team will supplement the aircrew and provide the radiological expertise for the mission as well as operate the SPARCS system. The SPARCS system displays the detector count rates, GPS coordinates, and flight track displayed on satellite imagery. A series of aerial training and exercise missions are conducted which include point source flyovers, grid pattern search for a lost source, and ground deposition surveys for a dispersal incident or accident.

Following each aerial mission, a debriefing is conducted with the radiation experts, equipment operators, and aircrew. The data is downloaded, analyzed, and graphical visual aids prepared within minutes for emergency managers to provide situational awareness and assist in emergency response operations.

Figure 1. I-AMS SPARCS system installed in a helicopter and tested by radiation experts.

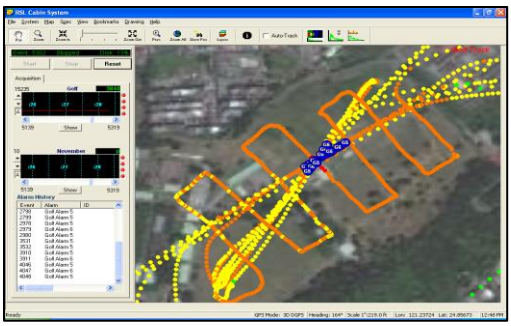

Figure 2. I-AMS flight data from a training mission showing the location of elevated readings.

Figure 3. I-AMS experts conduct a low altitude search mission in an international exercise.

3. I-AMS Advanced Course

Once a country establishes a baseline capability, additional four-day advanced training courses can be conducted at the DOE Remote Sensing Laboratory in Las Vegas, Nevada. The Remote Sensing Laboratory is the home base for the DOE AMS system and operates both fixed-wing (King Air B-200) and rotary-wing (Bell-412) aircraft which can be used for training during the practical exercises. The course participants include radiation experts and emergency managers from around the world that are responsible for developing and enhancing their nation's aerial detection capability. Participants are encouraged to share overviews of their emergency response organizations, the role of aerial detection assets in those organizations, and future program plans.

The first two days of the course are dedicated to classroom lectures and discussions by DOE AMS experts on operational safety, theory of aerial detection, mission profiles, aerial detection systems, and data analysis and interpretation. The participants also receive extensive hands-on training with the SPARCS system including setup, calibration, and operational testing. The SPARCS system is then installed in the aircraft and the mission planning process begins with the participants, AMS experts, and aviation aircrew. The following day the participants receive aviation safety training from the aircrew and participate in practical exercise flights while operating the SPARCS system. The AMS experts are on-board the aircraft with the participants to interface with the aircrew and provide additional instruction on the SPARCS system and aerial measurement techniques.

The Remote Sensing Laboratory is located near the Nevada National Security Site which has an operational environment to fly training missions over a variety of radioactive materials. Mission exercises include point source flyovers to simulate aerial search for a lost radiation source to large contaminated areas from past nuclear testing to simulate aerial surveys over contamination from a dispersal incident or accident. The overall goal of this course is to provide mission relevant, practical training experience with dedicated flight time over a variety of radiation environments.

Figure 4. I-AMS hands-on classroom training with the SPARCS detection system.

Figure 5. I-AMS mission practical training in the U.S. with the DOE Bell-412 helicopter.

Figure 6. I-AMS post-mission debriefing and technical discussion of the SPARCS aerial data.

4. Conclusion

Whether in the initial stages of developing an aerial detection capability or enhancing an existing national capability, the I-AMS courses provide partner nations the opportunity to increase their knowledge and experience in aerial radiological emergency response through classroom lectures and discussions, interactive demonstrations, hands-on radiation detection equipment training, and practical field exercises. The I-AMS courses provide partner nations the opportunity to share best practices among AMS experts, emergency managers, and aviation aircrews to develop and enhance aerial detection capabilities worldwide.

References

[1] International Emergency Management and Cooperation Course Catalog, U.S. Department of Energy, National Nuclear Security Administration, Washington, D.C. (2015).