International Assistance in an Emergency: Enhancing International Assistance Capabilities Using Aerial Measuring Systems

P. WASIOLEK, A. HEINRICH, R. MAURER

DOE/NNSA Office of Nuclear Incident Policy and Cooperation and National Security Technologies, LLC
Remote Sensing Laboratory
Washington, DC, and Las Vegas, NV, USA

This work was done by National Security Technologies, LLC, under Contract No. DE-AC52-06NA25946 with the U.S. Department of Energy.
The Aerial Measuring System (AMS) is a U.S. DOE emergency response asset that provides rapid and comprehensive worldwide aerial measurements, analysis, and interpretation capability in response to a nuclear/radiological emergency.

Its main mission is airborne radiation detection of ground contamination following a radiological emergency and location and identification of radiological anomalies (radioactive sources).
What Constitutes an AMS Asset?

Aerial Radiation Detection Asset

- Aircraft
- Radiation Detection Equipment
- Relevant Training
International Assistance by AMS

- U.S. DOE **Aerial Measuring System (AMS)** Program has been providing assistance to international community as far back as the 1980s, performing radiological surveys of:
  - former British nuclear test site in Maralinga in South Australia in 1987,
  - Paldiski Naval Reactor Training Facility in Estonia in 1995.
International Assistance by AMS

- **Standard assistance:** A registered capability in IAEA RANET (2010)

- **Enhanced assistance:**
  - Since 2010, U.S. DOE NNSA has provided training courses (I-RAPTER, I-CM, I-MED) designed to assist Partner Nations and international organizations in their development of nuclear/radiological emergency management capabilities. This includes an AMS component (**Basic I-AMS**) incorporated into other training modules.

  - As result of Fukushima NPP accident, and demonstrated significant role played by aerial radiation measurements, an advanced international AMS (**Advanced I-AMS**) training for Partner Nations has been offered starting in 2014.

  - Fukushima response created new challenges to AMS (operating in foreign country, in complex terrain, using non-dedicated aircraft in presence of airborne radioactivity). To address them, from 2012, AMS has been hosting annual **AMS International Technical Exchanges**, as forum for AMS problem solving.
Requesting and Receiving Assistance

U.S. registered capability in IAEA RANET includes AMS for both EBS and FAT

Externally Based Support – EBS
Technical advice and analytical expertise to address nuclear or radiological events provided from home offices or other offsite locations. This support is not deployed to the event scene.

Field Assistance Team – FAT
A group of technically qualified and equipped personnel that may be called upon to provide in situ assistance in a requesting State.
### RANET Registered AMS Capabilities

<table>
<thead>
<tr>
<th>Country</th>
<th>RS-4 AMS</th>
<th>SSR-3 Aerial Search</th>
</tr>
</thead>
<tbody>
<tr>
<td>Austria</td>
<td>FAT</td>
<td>EBS</td>
</tr>
<tr>
<td>China</td>
<td>FAT</td>
<td>EBS</td>
</tr>
<tr>
<td>Czech Republic</td>
<td></td>
<td>EBS</td>
</tr>
<tr>
<td>France</td>
<td>FAT</td>
<td>FAT</td>
</tr>
<tr>
<td>Germany</td>
<td></td>
<td>EBS</td>
</tr>
<tr>
<td>Israel</td>
<td>FAT</td>
<td></td>
</tr>
<tr>
<td>Japan</td>
<td></td>
<td>EBS</td>
</tr>
<tr>
<td>Korea, Republic of</td>
<td>FAT</td>
<td>EBS</td>
</tr>
<tr>
<td>Nigeria</td>
<td>FAT</td>
<td></td>
</tr>
<tr>
<td>Romania</td>
<td>FAT</td>
<td></td>
</tr>
<tr>
<td>Sweden</td>
<td>FAT</td>
<td></td>
</tr>
<tr>
<td>United Kingdom</td>
<td></td>
<td>EBS</td>
</tr>
<tr>
<td>United States of America</td>
<td>FAT</td>
<td>EBS</td>
</tr>
</tbody>
</table>

(Source: P. Kenny, IAEA Incident and Emergency Centre, 2015 AMS International Technical Exchange, Las Vegas, NV)
U.S. AMS Deployable Capability

- Over 30 AMS qualified specialists--scientists, data analysts, equipment operators, and pilots
- 4 RSX-3 systems by RSI, Inc., in aircraft-independent configuration
- Portable GPS aircraft navigation systems (Garmin, iPad) for pilot’s guidance
- 2 AMS dedicated aircraft (1 rotary, 1 fixed wing)
- AMS Reachback (web-based) with specialized software for aerial data analysis
- International experience (majority of AMS personnel responded to Fukushima Daiichi NPP accident)
- Systems validated against French, UK, and Canadian assets
DOE provides Partner Nations an aerial/mobile radiation detection instrument: Spectral Advanced Radiological Computer System (SPARCS)

- Modular radiation detection system designed for use in any mobile platform (i.e., car, truck, boat, and aircraft)
- Two different detector configurations: aerial–SPARCS-A; and mobile–SPARCS-M
- Installation and ready-to-operate in 30 minutes
- 12-28 volt battery power
- User-friendly graphical user interface

To date, world inventory includes 17 SPARCS-A and 24 SPARCS-M distributed to 12 countries/entities.
Incident Preparedness: Basic I-AMS Training

- Target audience: radiation professionals, aircrews, and emergency managers responsible for aerial radiological measurements
- Delivery: at host nation location
- Pre-requisite: basic knowledge of radiation detection
- 2 or 4 day course (+1 day with translation)
- Instructors from U.S. DOE radiological emergency response programs
- Focus on SPARCS operation and basic flight missions
Incident Preparedness: Advanced I-AMS Training

- Target audience: radiation professionals, aircrews, and emergency managers responsible for aerial radiological measurements
- Delivery: at the Remote Sensing Laboratory (RSL) in Las Vegas, Nevada
- Pre-requisite: I-AMS Basic and established national aerial radiological response program
- 5-day course (in English only)
- Class size 8-12
- Instructors from U.S. DOE AMS radiological emergency response program
- Focus on: Comprehensive mission planning, execution (students fly on AMS aircraft), and data analysis
AMS International Technical Exchanges

- Started in 2012 as international group (Denmark, UK, Switzerland, Canada, France, Sweden, Norway, US) of AMS experts addressing aerial measurement and data analysis issues encountered in Japan


- 2014 - Topic: AMS Data Analysis (Iceland, France, Norway, Sweden, IAEA, US)


- 2016 - Topic: UAV/UAS for Radiological Emergencies (Argentina, Chile, Canada, Denmark, France, Germany, Japan, Norway, Sweden, Switzerland, South Korea, US, IAEA, CTBTO)
Bilateral Joint Surveys

November 2007 – US AMS and French HELINUC joint survey at Nevada Test Site

May 2010 – US AMS and UK AWE joint survey at the Nevada Test Site

January 2014 – US AMS and Canada NRCan joint survey at Nevada Test Site followed by discussion on cross-border contamination due to NPP accident

January 2017 – planned US AMS and French IRSN joint survey at Nevada National Security Site (former Nevada Test Site)

Benefits – comparing acquisition and data analysis processes, establishing scaling factors, creating international teams
Challenges of International Work

Luxurious transportation

Comfortable sleeping quarters

Ergonomic work space
Summary

For more information please contact:

Ann Heinrich
Deputy Director
Office of Nuclear Incident Policy and Cooperation
202-586-8165
U.S. DOE/National Nuclear Security Administration
Ann.Heinrich@nnsa.doe.gov