DEFENCE R&D DÉFENSE

Defence R&D Canada – Valcartier

Propagation and Aerosol Evaluation Facilities

- **Fully instrumented:**
  - wavelength coverage from the visible to the millimetre-wave spectral region;
  - transmissometers and particle sizers and mass monitoring;
  - cloud mapping capabilities.
- **Wide variety of aerosols and atmospheres.**
- **Ideally suited for:**
  - evaluation of surveillance and guidance systems;
  - development of smoke screens and counter-measure systems;
  - calibration of lidar and standoff detection systems.
- **Available for commercial use.**

Propagation corridor

Fog, Smoke and Dust

To an increasing degree, military operations depend on surveillance, reconnaissance and target-tracking information gathered by sensors. The characteristics of the intervening atmosphere, either natural or modified by some defensive screening agent, determine how effective and successful the sensing devices (camera, radar, etc.) will be. Atmospheric aerosols - suspensions of small liquid or solid particles in air - can profoundly affect the transmission of light or other electromagnetic radiation, as evidenced by the sharp reduction of visibility in fog, an aerosol that occurs naturally.

Military surveillance and targeting systems must face both the wide variety of naturally occurring aerosols and those generated deliberately to screen potential targets: smoke screens of varying sophistication, in particular. The ability to measure the characteristics of such propagation media is vital to the development and proper use both of surveillance equipment and of appropriate countermeasures.

Controlled measurement conditions

DRDC Valcartier has two instrumented test chambers: a vertical silo and a horizontal propagation corridor. These gather the basic data and information needed to predict the performance of electro-optical or radar equipment operating in the wavelength range from the visible to the millimetre portion of the electromagnetic spectrum, and to suggest effective counter-measures for such systems. Both chambers are equipped with particle sizers and with transmissometers for in-situ measurement of the transmission in the visible and infrared wavebands. Several types of aerosols and atmospheres can be tested and they are usually generated with pneumatic nozzles. In the silo-shaped chamber, explosive dissemination of aerosols is also possible.

The following types of aerosols and atmospheres have already been measured in the chambers:

- Water droplets (20-30 μm)
- Fog-oil (0.3 μm)
- Glass beads (1-5 μm)
- Metallic flakes (0.1 μm × 5 μm)
- Hollow spheres (50-100 μm)
- Biological agent simulants
- Trace gases and chemical agents.

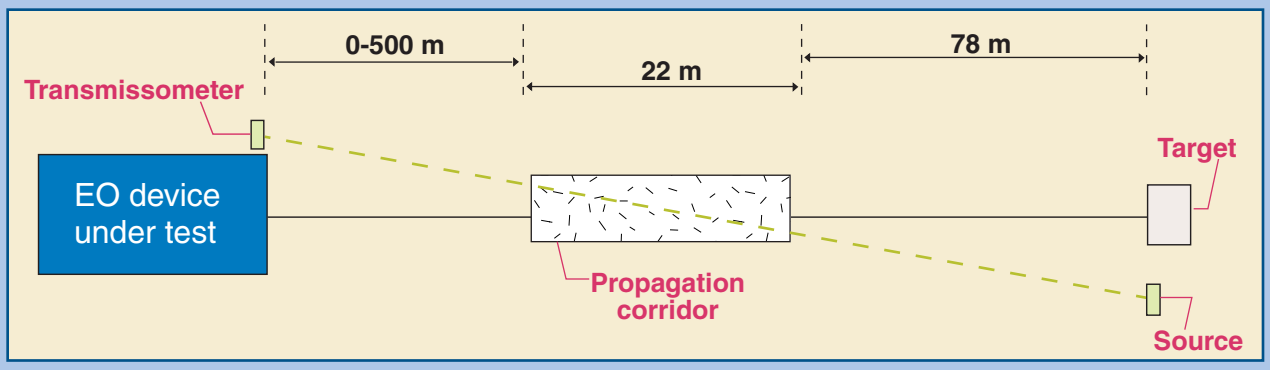
In addition to the characterization of aerosols in the controlled environment of the test chambers, measurements can also be carried out remotely on open-air clouds with a laser-based scanning lidar system (also called a cloud mapper), which provides 3D, time-resolved maps of the development and dispersal of the smoke cloud under test.

Propagation and Aerosol Evaluation Facilities

Silo Chamber:

The picture (left) shows the silo chamber with its associated equipment and control rooms. Because it can be sealed from the exterior atmosphere, the chamber is ideally suited for the development and characterization of counter-measure smoke screens. The chamber is instrumented for monitoring mass concentration and is equipped for explosive generation of aerosols.

- *Total volume = 326 m^3, diameter = 6 m, height = 11.5 m*
- *Pneumatic or explosive aerosol generation and dissemination*
- *Mass concentration monitoring of aerosols*
- *Visible, near IR and IR transmissometers*
- *Controlled humidity and temperature*



Horizontal Propagation Corridor:

The picture on the front page of this data sheet shows the propagation corridor, with its end doors in the dropped-down position. In normal operation, the corridor is first filled with aerosols while the canvas end doors are closed. When the desired concentration and uniformity are reached, the collapsing doors are opened, and the measurement can proceed on the cloud volume for several seconds (depending on wind conditions).

The diagram above shows typical experimental layout. It also shows that longitudinal transmissometers can be used in parallel with the EO device axis, which makes the corridor ideal for field emulation and realistic testing of passive and active (electro-optical, radar, etc.)

- *Total volume = 126 m^3, length = 22 m, cross-section = 2.4 × 2.4 m^2*
- *Generation of aerosol clouds from 0.01 to 12 optical depths*
- *Door opening time < 0.5 sec*
- *Transverse (in-situ) visible and near IR transmissometers*

DRDC Valcartier offers its expertise in highly specialized measurements with unique world-class facilities.

For more information

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