

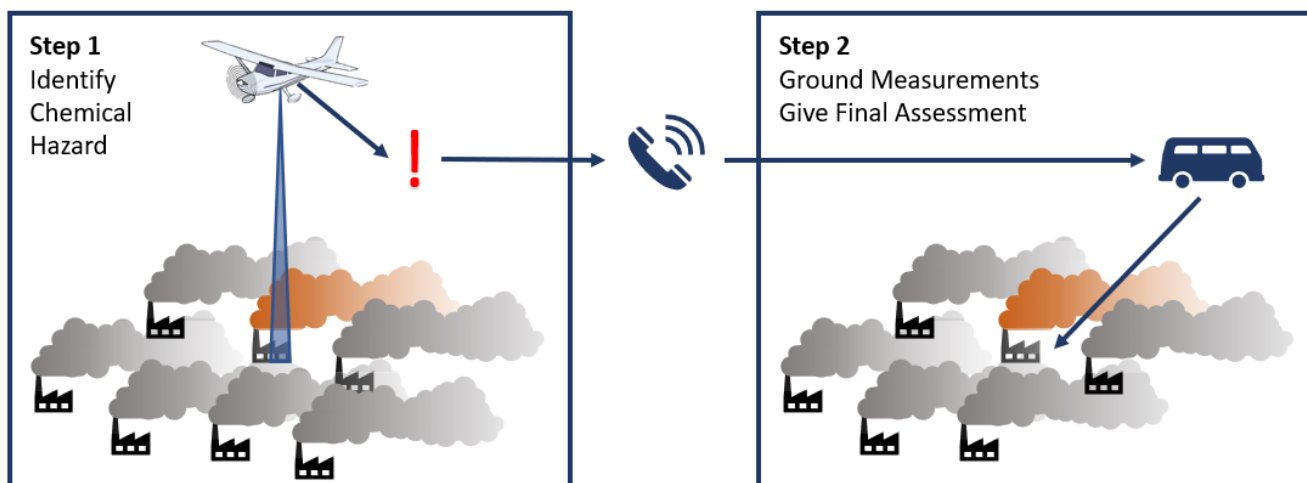
Brief Introduction to Remote Chemical Sensing with ASPECT

The EPA's Airborne Spectral Photometric Environment Collection Technology (ASPECT) airplane is an emergency response asset that is available 24/7 to provide situational awareness of incidents involving chemical and radiological hazards. This brief will give a high-level overview of how ASPECT can be used for chemical detection.



ASPECT is a Screening Tool

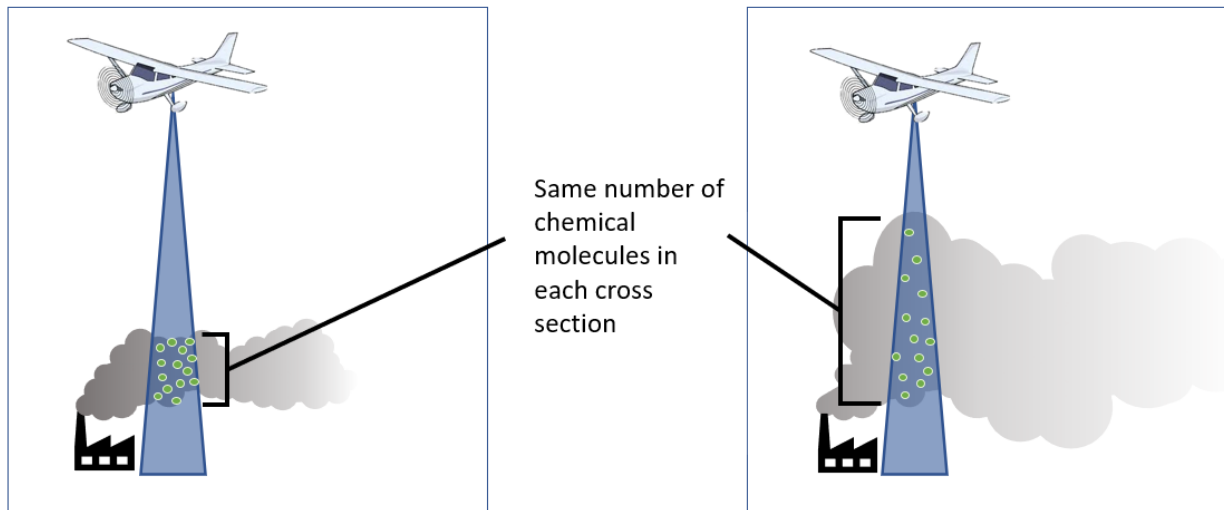
ASPECT can quickly cover a large area and help identify regions of concern for select chemical hazards. This information can then be relayed to ground teams for more refined assessment of the identified locations.



ASPECT is not a trace gas detector and does not take direct measurements from the plume. As a standoff detection technology, the concentrations provided are estimates (the level of detection is in the ppm range). Further sampling with ground-based direct measurement sensors in the areas of concern that are identified by ASPECT can provide more accurate quantification for decision making purposes.

Chemical Concentrations from ASPECT Are Estimates

ASPECT “counts” chemical molecules – in the raw data, these plumes look the same



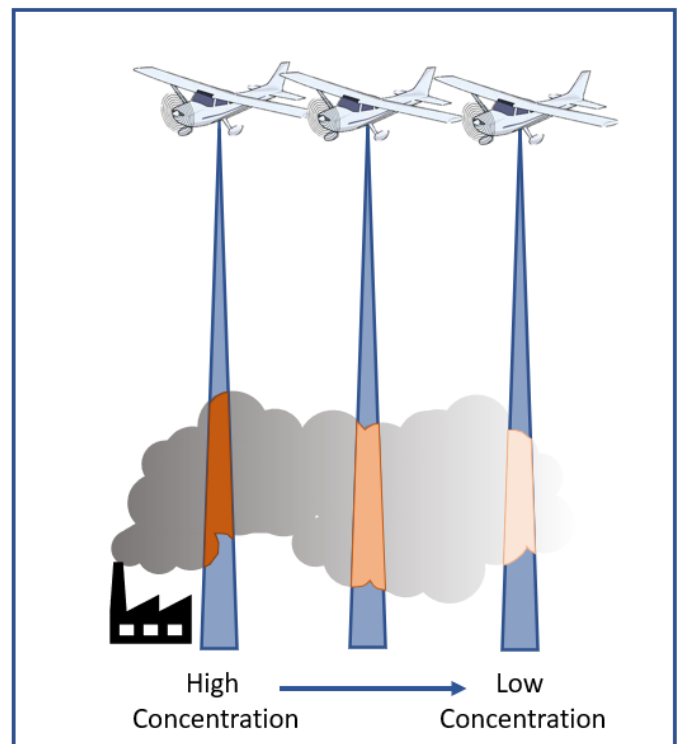
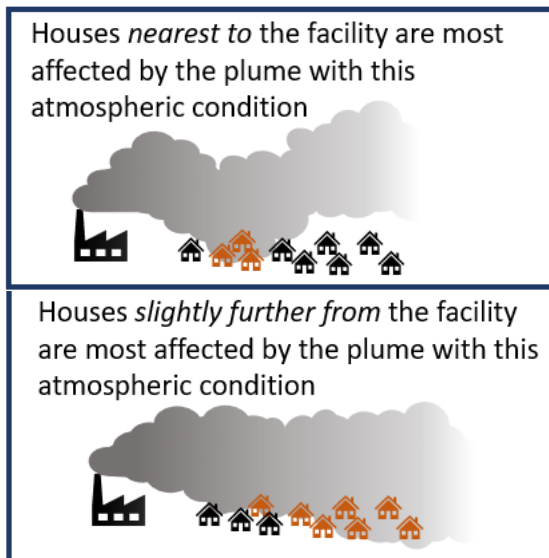
Higher Concentration, Smaller Plume

Lower Concentration, Bigger Plume

When estimating the chemical concentration, the ASPECT data analysts make assumptions about the dimensions of the plume. Because of this, the data provided is not the best assessment of the concentration that people may be exposed to at ground level. What the data *can* do is narrow down the potential areas of concern that should be prioritized for further assessment.

ASPECT Can Provide Rapid Information as a Situation Changes

Since ASPECT is an airborne platform, it can take measurements at many different locations within and around a given hazard. This monitoring can be especially important as conditions like weather and the activity of the source changes.



Advantages and Disadvantages of Standoff Detection

Advantages	Disadvantages
<ul style="list-style-type: none"> • Quick Assessment • Can often go where other sensors can't go • 4D evaluation (time and space) • Can see potential hazards that have not reached ground level yet 	<ul style="list-style-type: none"> • Not direct measurement – less precise than benchtop equipment • High limits of detection (ppm range) – not appropriate for very low level, non-acute hazard assessment • Non-standardized equipment - no industry-certified standard operating procedures

Chemicals That ASPECT Screens For

ASPECT Auto-Detect List Detection Limits Listed in (ppm*m)

Acetic Acid (2.0)	Cumene (23.1)	Isoprene (6.5)	Phosphine (8.3)
Acetone (5.6)	Diborane (5.0)	Isopropanol (8.5)	Phosphorus Oxychloride (2.0)
Acrolein (8.8)	1,1-Dichloroethene (3.7)	Isopropyl Acetate (0.7)	Propyl Acetate (0.7)
Acrylonitrile (12.5)	Dichloromethane (6.0)	MAPP (3.7)	Propylene (3.7)
Acrylic Acid (3.3)	Dichlorodifluoromethane (0.7)	Methyl Acetate (1.0)	Propylene Oxide (6.8)
Allyl Alcohol (5.3)	1,1-Difluoroethane (0.8)	Methyl Acrylate (1.0)	Silicon Tetrafluoride (0.2)
Ammonia (2.0)	Difluoromethane (0.8)	Methyl Ethyl Ketone (7.5)	Sulfur Dioxide (15)
Arsine (18.7)	Ethanol (6.3)	Methanol (5.4)	Sulfur Hexafluoride (0.07)
Bis-Chloroethyl Ether (1.7)	Ethyl Acetate (0.8)	Methylbromide (60)	Sulfur Mustard (6.0)
Boron Tribromide (0.2)	Ethyl Acrylate (0.8)	Methylene Chloride (1.1)	Sulfuryl Fluoride (1.5)
Boron Trifluoride (5.6)	Ethyl Formate (1.0)	Methyl Methacrylate (3.0)	Tetrachloroethylene (10)
1,3-Butadiene (5.0)	Ethylene (5.0)	MTEB (3.8)	1,1,1-Trichloroethane (1.9)
1-Butene (12.0)	Formic Acid (5.0)	Naphthalene (3.8)	Trichloroethylene (2.7)
2-Butene (18.8)	Freon 134a (0.8)	n-Butyl Acetate (3.8)	Trichloromethane (0.7)
Carbon Tetrachloride (0.2)	GA (Tabun) (0.7)	n-Butyl Alcohol (7.9)	Triethylamine (6.2)
Carbonyl Fluoride (0.8)	GB (Sarin) (0.5)	Nitric Acid (5.0)	Triethylphosphate (0.3)
Carbon Tetrafluoride (0.1)	Germane (1.5)	Nitrogen Mustard (2.5)	Trimethylamine (9.3)
Chlorodifluoromethane (0.6)	Hexafluoroacetone (0.4)	Nitrogen Trifluoride (0.7)	Trimethyl Phosphite (0.4)
Chloromethane (12)	Isobutylene (15)	Phosgene (0.5)	Vinyl Acetate (0.6)