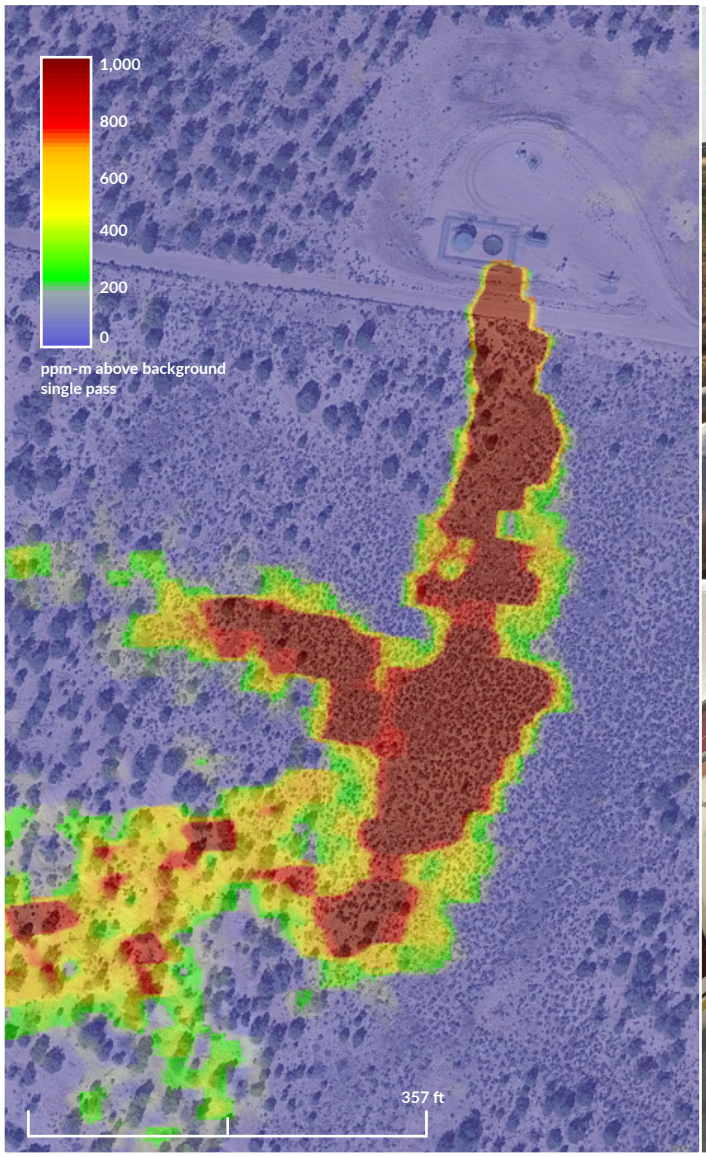
METHANE MONITOR



GO BEYOND WITH BALL.®

Our innovative Methane Monitor enables customers to quickly, easily and precisely detect and respond to hazardous methane leak emissions, helping to ensure the health of the nation's valuable oil and gas infrastructure.

OVERVIEW

The Ball Aerospace Methane Monitor uses advanced laser technologies to precisely measure atmospheric methane concentrations and identify leaks. With high chemical sensitivity and wide-area mapping, the Methane Monitor delivers high-accuracy data in near real-time, enabling facility operators to quickly and cost-effectively map entire infrastructures with extreme sensitivity to find and source individual leaks.

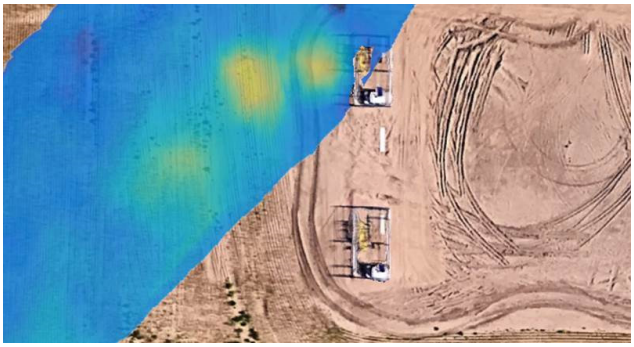
Flown from a fixed-wing aircraft, Methane Monitor can survey more than 100 square miles of oil and gas production regions per day, or 375 miles of transmission pipelines per day. Flight data is geo-located and fused with land imagery to provide easy-to-interpret images of emission plumes.

The Methane Monitor leverages Ball's more than 60 years of designing and building innovative remote sensing systems for NASA, NOAA, the U.S. Department of Defense and commercial companies.

CHARACTERISTICS

PARAMETER	PERFORMANCE
Operating Wavelengths	Near-infrared, around 1,650 nm
Air/ground Speed	125 mph (55 m/s)
Altitude	Up to 3,500 ft (1,070 meters) above ground level*
Methane Sensitivity	~50 ppm-m above background, single path from air to ground. See "Performance" graphic to correlate chemical sensitivity to leak rate.
Leak Rate Detection Threshold	<50 SCFH
Geo-location Accuracy	<10 m (33 ft)

*Depending on customers' service objectives

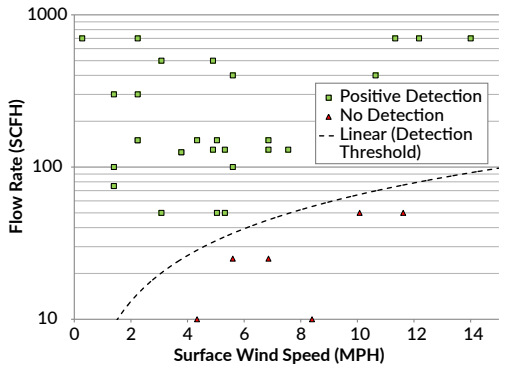


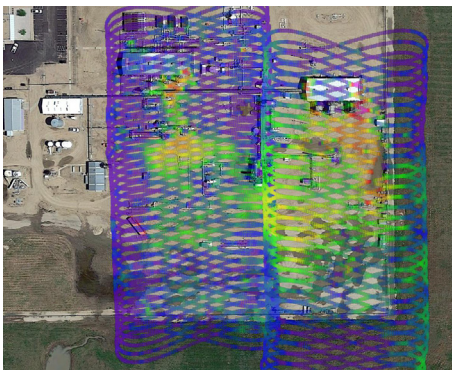
Fugitive emission from a production well. Peak concentrations are about 70% (350 ppm-m) above the ambient background methane (data with interpolation, by post processing).

ADVANTAGES

- **Lower-Cost:** Employs fixed-wing aircraft operating at altitudes up to 3,500 ft (1,070 meters) above ground level, thereby reducing operating costs and improving safety, as compared to helicopter-based sensors
- **Reduces false-positive indications:** Graphical imagery identified sources by imaging the shape and contours of a gas plume, distinguishing sources that are off-system, from sources within operators' assets
- **Timely results:** Real-time, on-board data processing allows facility operators to be alerted immediately of large emission sources. A summary of results is delivered within a few hours after flight, with a full report within 24 hours.
- **Precision:** Automatically targets and scans designated assets; mitigating effects of aircraft motion and imprecise navigation while geo-locating concentration data. Automatically flags where survey targets are missed for reporting and re-flight planning.

Nominal performance: emission rate vs wind speed scatter-gram shows detection threshold.





Large indication of emission from natural gas handling facility readily captured. (Real-time data without interpolation. Highest concentration exceed 5,000 ppm-m above background, double-path)

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