

ANGEL Services

(Airborne Natural Gas Emission LIDAR)

Technology Development & Industry Experience

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ANGEL Services Development History

• U.S. DOE NETL Contract History

- 2003: U.S. DOE Support through NETL Development Contract
 - *Airborne DIAL sensor development and testing for detection of natural gas emissions*
 - RMOTC Field Testing

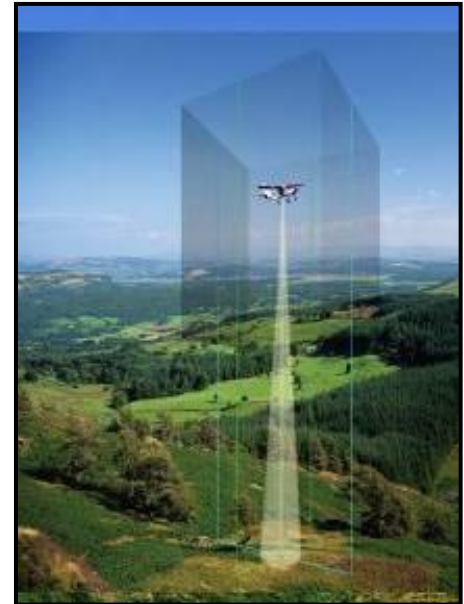
• U.S. DOT PHMSA Contract History

- 2005: HALOS (*Hazardous Liquids Detection and Measurement*)
 - U.S. DOT Support through PHMSA Development Contract
 - DIAL development and testing for detection and measurement of hazardous liquids with **El Paso Corp.**
 - Airborne DIAL testing over Diesel Fuel, Gasoline, Jet A, Crude Oil, Propane
- 2006: *Rapid Emergency Response Development*
 - U.S. DOT Support through PHMSA Development Contract
 - **PG&E** as evaluation partner
- 2006 – 2009: Various U.S. DOT R&D Forums

• U.S. EPA Climate Change

- 2004 – 2009
 - Natural Gas STAR
 - Methane To Markets

• Commercial Operations – Launch 2004. Exit 2009.



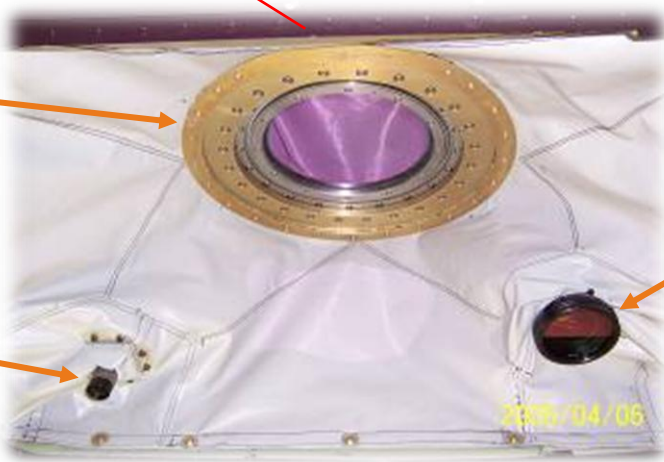
ITT ANGEL Services

Aircraft and Sensor Suite



DIAL
Sensor

Digital
Video
Camera



High
Resolution
Mapping
Camera

Can you see the leak?



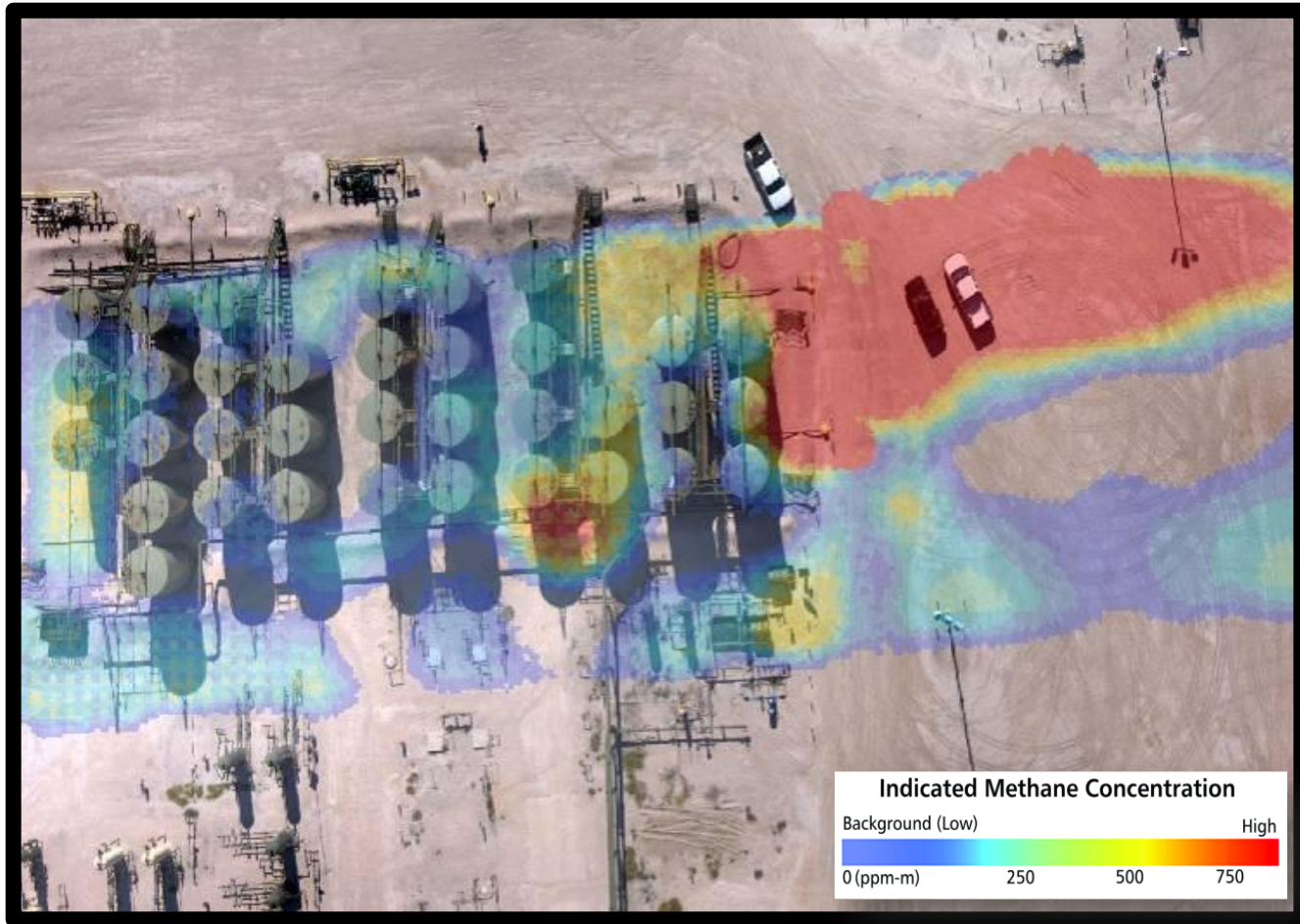
ITT ANGEL Services - *We Can.*



Can you see the leak?



ITT ANGEL Services - *We Can.*



ITT's Request for Interpretation (August 2009)

Specific Questions Posed to DOT PHMSA for Clarification:

1. Does OPS require the use of leak detector equipment in all Class Locations in order to meet the leakage survey requirements of § 192.706?
2. Does OPS require that each transmission pipeline be individually leak surveyed, frequency dependent on Class Location, in order to meet the requirements of § 192.706?
3. Does observing surface conditions on and adjacent to the transmission pipeline right-of-way for indications of leaks as required by § 192.705, Transmission lines: Patrolling, meet the § 192.706 requirement for leakage surveys of transmission pipelines in any Class Location?

ITT's Request for Interpretation

- **Outcome of US DOT PHMSA Clarification (Nov 2009):**

“... under the current code language an operator could potentially utilize an alternate leakage survey method such as an over-the-line vegetation survey in Class 1 and Class 2 locations and for transmission lines with odor or odorant in Class 3 and Class 4 locations, but only if the operator can demonstrate that such a survey would be effective in identifying any leaks. This means that an over-the-line vegetation survey must be performed during the time of year when vegetation is in its growth cycle (i.e., spring or summer) and the operator must be able to document that such a survey would be effective based on the time of year, weather conditions, ground visibility, soil conditions, location of the pipeline, etc. Even under these circumstances, additional leakage survey methods potentially involving leak detection equipment would be necessary in locations without vegetation cover such as road crossings, paved areas, dead soil areas with no vegetation, and other such areas.”

- <http://www.phmsa.dot.gov/staticfiles/PHMSA/DownloadableFiles/Files/Interpretation%20Files/Pipeline/2009/PI-09-0018.pdf>
- **ITT took the business decision to exit commercial operations of *ANGEL Services* by year-end 2009.**

Can you see the leak?





Thank You

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