U.S. Department of Transportation

HAZARDOUS LIQUIDS AIRBORNE LIDAR OBSERVATION STUDY (HALOS) DTRS56-04-T-0012

OPS ACCOMPLISHMENTS

Pipeline Safety Research and Development for Hazardous Liquids Leak Detection

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CHALLENGE

In the U.S. there are nearly 60,000 miles of LPG and NGL pipelines and over 70,000 miles of refined product lines carrying gasoline, diesel fuel, and other hydrocarbon fuels. Leaks from these pipelines present an explosion risk, and environmental damage from even a minor leak can be expensive to remediate, especially given increasingly stringent regulatory oversight. Considering the length of pipelines that must be inspected and the risks faced when a leak occurs, pipeline owners and operators spend a significant amount of time, effort and money to ensure the integrity of their pipelines. A leak of a few gallons per hour is a small fraction of total pipeline flow and practically undetectable with current methods. If left undetected, even a small leak can result in enormous environmental damage. The detection of small, slow leaks of hazardous liquids is one of the major challenges facing the DOT and the pipeline industry.

ITT Industries Airborne Natural Gas Emission Lidar (ANGEL) system detecting leaks along a pipeline

TECHNOLOGY DESCRIPTION

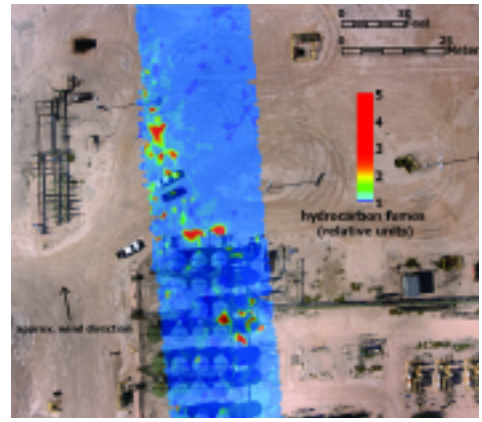
This R&D effort is to develop an understanding of the physical and spectral properties of hazardous liquid pipeline leaks and design a system capable of detecting and imaging such leaks from an airborne platform. This study will leverage ITT Industries Airborne Natural Gas Emission Lidar (ANGEL) system. Specifically, the research includes:

1) Modeling and physically measuring hazardous liquid pipeline leaks
2) Using the ANGEL system to detect hazardous liquids, both in ground tests and from the air
3) Developing a hazardous liquid leak detection sensor road map
4) Conducting a hazardous liquid airborne sensor concept trade and design study

ACCOMPLISHMENTS

ITT has successfully detected a variety of hazardous liquid materials using the ANGEL system. In cooperation with El Paso Production and Texas A&M University in flights near Corpus Christi, Texas, the ANGEL system detected condensate vapors vented from large storage tanks. In Spencerport, New York the ANGEL system was used to detect natural gas and propane in a series of controlled releases. In ground tests in Rochester, New York, ITT has detected gasoline vapors at a distance of more than 500 feet.

Detection of hydrocarbon vapors from a series of EL Paso Gas condensate tanks in Kingville, Texas. The "thief hatches" were opened on these tanks moments before this over-flight to create a large plume of vapor to simulate a leak.

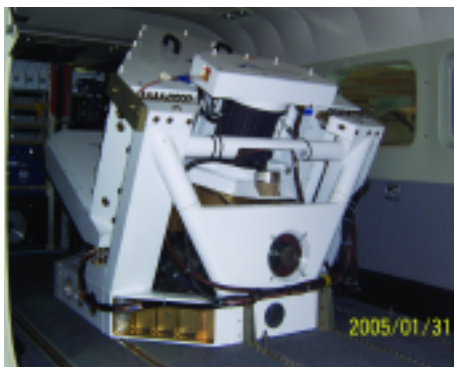


BENEFITS

This research will benefit pipeline safety by allowing the detection of hazardous liquid pipeline leaks from the air. In the future, commercially available hazardous liquid leak detection systems will allow for the rapid and efficient detection of small pipeline leaks.

FUTURE ACTIVITIES

The HALOS team will conduct a series of engineering trade studies to guide the design of a next generation sensor system. The HALOS Sensor will leverage our learning from the operation of the ANGEL system and will be designed as a commercial system capable of detecting both natural gas and hazardous liquid pipeline leaks from the air.



ITT designed DIAL sensor integrated into Cessna 208 B aircraft

ITT Industries aircraft that houses the Airborne Natural Gas Emission Lidar (ANGEL) system.

TEAMMATES IN SUCCESS

- Philcon
- Texas A&M University - Corpus Christi, Pollution Prevention Partnership
- El Paso Production

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