U.S. Department of Transportation

AIRBORNE LIDAR PIPELINE INSPECTION SYSTEM (ALPIS) MAPPING TESTS

OPS ACCOMPLISHMENTS

Damage Prevention and Leak Detection For Pipeline Safety Research & Development

Challenge

Natural gas and hazardous liquid pipeline operators have a need to identify where leaks are occurring along their pipelines in order to lower the risks the pipelines pose to people and the environment. Current methods of locating natural gas and hazardous liquid pipeline leaks can be cumbersome, expensive, and not always accurate. The industry has a need for a cost-effective airborne system that can detect and map leaks accurately and quickly.

Technology Description

The Airborne LIDAR Pipeline Inspection System (ALPIS) is an airborne remote sensing system for detecting leaks associated with natural gas and hazardous liquid pipelines. ALPIS uses differential LIDAR, (Light Detection and Ranging), to detect the presence and concentration of hydrocarbons in the atmosphere. The system employs a digital camera and a global positioning system (GPS) to provide visual, cartographic representations of surveyed areas. Data collected with ALPIS can be incorporated into a geographic information system (GIS) to create mapping databases. Project goals are to achieve survey speeds of up to 150 miles per hour and cost equal to or less than much slower survey methods currently available.

ALPIS with added upgrades

Accomplishments

Phases I and II of the ALPIS project are complete. Phase I, conducted from April 2001 through April 2002, included a proof of design and testing using a small compact airborne platform, including leak detection tests on the ground and in the air. Phase II, conducted from April 2002 through April 2003, included an upgrade of the LIDAR system that reduced measurement errors and addition of a digital camera with Global Positioning System (GPS) receiver for accurate mapping and visualization capabilities. Phase II demonstrated the system's ability to detect ethane from natural gas pipeline leaks and accurately measure leak plume dynamics. Flight tests of the upgraded system were completed in December 2002.

TEST SUMMARY
Altitude: 220-500 ft.
Speed: 0-100 mph
Chemical: methane
Duration: 1 hour

LaSen's first full-scale Airborne LIDAR test at Afton Compressor Station

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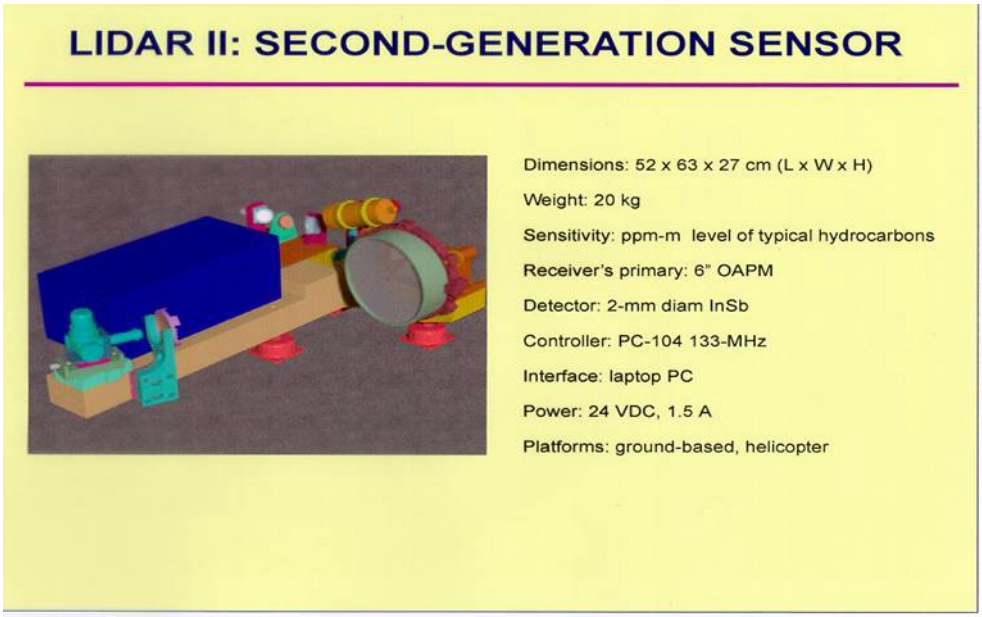

Benefits

Once ALPIS is completed, pipeline operators will have at their disposal a fast, efficient, and accurate tool for detecting and mapping natural gas and hazardous liquid pipeline leaks. ALPIS will also allow operators to survey their pipelines much more quickly than is possible with conventional technologies. In addition, cost per mile of pipeline surveyed is also expected to be comparable to or below that associated with currently available technologies.

Future Activities

Future activity in the ALPIS project is aimed at moving the technology from an engineering research prototype to a commercialized leak detection and mapping system that the pipeline industry can use. Therefore, a major objective is to determine the system's reliability and accuracy in locating and mapping leaks associated with natural gas pipelines. This requires the LIDAR sensor to locate a high percentage of leaks that can be verified by ground surveys while minimizing false positive detection. To accomplish these goals, future work will involve upgrading some of the hardware and software associated with ALPIS and performing flight tests in coordination with the pipeline industry.

Partners in Success

- **LaSen Inc.**
- **U.S. Air Force**

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