U.S. Department of Transportation
Pipeline and Hazardous Materials
Safety Administration

PHMSA RESEARCH & TECHNICAL PERSPECTIVES

Working Group 2 – Leak Detection

Gov/Industry Pipeline R&D Forum

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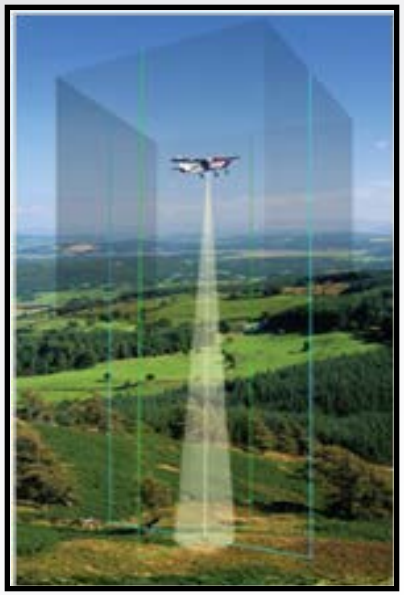
Outline

- PHMSA research historically since 2002
- Review results from last R&D Forum - Crystal City Virginia, June 24 -25, 2009 (Leak Detection/Mitigation)
- Summary of R&D Gaps defined at PHMSA Leak Detection Effectiveness Workshop March 27-28, 2012
- PHMSA perspective on some gaps to consider or other hot topic items
- Some current PHMSA actions
- Questions

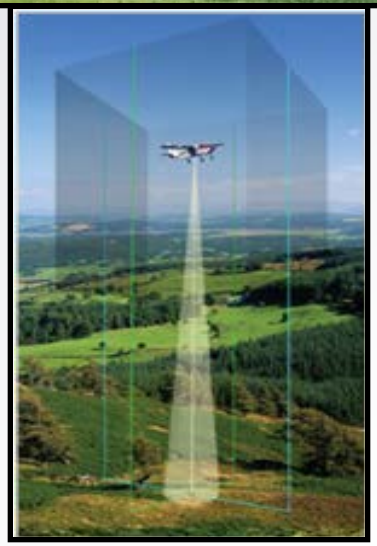
Haz. Liq. Leak Detection Research

- Stakeholder input sought/generated for Leak Detection (LD) improvements at 4 Pipeline R&D Forums
- Solicited for LD topics in 5 research solicitations since 2002
  - However not all LD topics successful in becoming new research
- HL LD Investment: 6 technology development projects using $1.5M (PHMSA)
- Success in 2 technology improvements to market addressing airborne and internal leak detection systems



Nat. Gas Leak Detection Research

- Stakeholder input sought/generated for Leak Detection (LD) improvements at 4 Pipeline R&D Forums
- Solicited for LD topics in 5 research solicitations since 2002
  - However not all LD topics successful in becoming new research
- Natural Gas LD Investment: 7 technology development projects using $3.7M (PHMSA)
- Success in 3 technology improvements to market addressing airborne and internal leak detection systems



2009 Forum - Gaps

- **Gap #1 – Small Leak Detection (Technology)**
  - All, but primary gap was liquid leak detection
- **Gap #2 – Leak Pinpointing (Technology)**
  - All, but primary gap/need was for distribution
- **Gap #3 – Aerial Reconnaissance (Technology) - All**
- Gap #4 – River Crossings (Technology) - All
- **Gap #5 – Odorant Issues (Technology / General Knowledge)**
  - *Class 2 &3 Gas Transmission, Gas Distribution*

Current Research

Fuelfinder: Remote Leak Detector for Liquid Hydrocarbons

Testing improvements to the Remote Methane Leak Detector for wavelength specific detection of gasoline blends and ethanol. Main objective is to develop a portable, hand-held sensor for detection of petroleum product leaks from buried pipelines at stand-off distances up to 30 meters or about 98 feet. Possible market penetration in early CY 2013.

3/27/12 - Improving Pipeline Leak Detection System Effectiveness

- Positives: Some very good discussion and successes in the area of LDS Effectiveness
- Some Issues/Gaps were defined. A primary issue in use of commercial leak detection systems is the number of false alarms. May lead to:
  - Loss of controller confidence in the leak detection system
  - Additional stress on controller workload
  - Missing of critical issues associated with other parts of the pipeline operation
  - Missing of valid leak detection alarm

March event – cont'd

- There are many reasons outside the control of the leak detection system for false alarms, among them are:
  - Communication issues
  - Measurement issues
  - Instrumentation issues
  - Maintenance activities
  - New operational scenarios
  - Tuning issues associated with the leak detection system

March - cont'd

- **Hazardous Liquid Pipeline Leak Detection System Capabilities and Research**
  - There is no *one size fits all* LDS; systems must be tuned to each pipeline segment. It was also noted there is no standard testing procedure for custom applications of LDS technology.
  - Potential future research projects include detection capability for upstream operations, transient operations, shut-in lines, very small persistent leaks and pre-existing leaks.

March Event

- **Natural Gas Pipeline Leak Detection System Capabilities and Research**
  - Internal systems are susceptible to compressibility influenced variances that make mass balance or pressure drop measurement difficult.
  - Redundant LDSs that can better determine the factual nature of alarms and assist in detection of small leaks were recommended.

Standard Issues we currently see

- Not choosing the best methods or technologies for the specific product(s) or complexity of system, or in some cases making it too complex for your personnel
- Sometimes more basic issues
  - Odorant effectiveness
  - Proper grading of leaks
  - Properly considering and integrating all threats, data etc
- Breakdown in Safety Management Systems and organizational factors
- Safety Culture, Just Culture, Informed Culture

Safety Management Systems

- SMS includes all aspects: technology, people and environment
- Issues in one or more can cause a failure of the system
  - Can have the best technology, but if people poorly trained or don't appropriately recognize and respond to cues, the system fails
  - Can have the most experienced and well trained people, but if technologies are poor, system fails
  - Can have the best technology and well trained people, but if there is a poor culture or company management mentality, system fails
- Focusing too much on discrete elements within the system and not enough on the system overall creates issues

Thoughts in general for R&D

- Liquids
  - Additional R&D, standard development, etc. to consider improving or developing consensus on timing for either leak detection overall, or the various detection, characterization, and mitigation phases?
    - Time to detection
    - Time between detection and verification of the alarm as real
    - Time between validating the leak alarm and to trigger containment

Thoughts in general for R&D

- Liquids
  - Any additional R&D needed to help with technologies, standards, knowledge sharing, etc for better leak detection coverage during transient operation, including pipeline shutdown, pipeline startup, and column separation
- Gas (in-line with NTSB P-11-10)
  - Additional R&D for SCADA tools to assist in recognizing and pinpointing the location of leaks, including line breaks
- Any R&D to help with continued process improvement for implementation of CRM and DIMP

Leak Study

- It is a liquid and gas study intended to help address both congressional mandate (liquids) and NTSB P-11-10 (gas).
- The intent is the study will be a standalone study. PHMSA's report to congress this year will be focused on liquid that will roll in relevant findings from the study that will be included as an attachment. Conversely, PHMSA will later likely send an update to NTSB focused on gas.
- Industry will be engaged for technical input, particularly on technical, operational, and economic feasibility of different technologies and standards or best practices that are currently being used.
    - Interviewing operators
    - Plan to engage trades (and public) in review of draft report of the leak study in October
- More in David Shaw's presentation

R&D – Across the board

- More technology demonstration projects to help accelerate technology transfer
- Consideration of Competitive Academic Agreement Program

Administration Hot Topics

- More applicable to some other working groups, but good to know what they may be talking about
  - **Hydrotesting**
  - **Cast Iron Pipe**
  - **Depth of Cover**
  - **Pipeline Design Life**
  - **In-Line Inspection Data**
  - **Stress Corrosion Cracking**
  - **Preventing / Mitigating Ground Movements**
  - **Construction Quality**

Questions?