Innovative Methane and Ethane Leak Detection Tool

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Overview

- Introduction to Ophir Corporation
- Ophir’s duoThane™ Technology
- Pipeline Demonstrations
- Commercialization Strategy
Ophir Corporation

- Colorado Small Business
  - Founded in 1980
- Successfully Completed over 90 Contracts
  - U.S. Government and Aerospace Companies
- Technology: Optical Remote Sensing Instrumentation
Ophir Corporation (cont’d.)

- Sole-source Supplier of only Laser Radar (Lidar) on the B-2 Stealth Bomber
- Military/Aerospace Design and Manufacturing Capability
- AS9000 Compliant (~ISO-9001)
Ophir Corporation (cont’d.)

◆ Previous Commercialization Success
  ▪ Over $38 Million in Optical Remote-Sensing Technologies
  ▪ Commercialization “Success Story”
    ● Army, Navy, NASA

◆ 15 Years of Experience with Airborne Optical Systems
  ▪ Own/Maintain Test Aircraft
Optical Detection and Identification of both Methane and Ethane – Remotely

Detection Sensitivity (300 m range)
- 50 ppb Methane
- 33 ppb Ethane

Long Term Ground-based Monitoring Capability
Airborne Monitoring Capability
duoThane™ Benefits

- Detects and Identifies both Methane and Ethane Concentrations
- Provides Relative Severity of Leak
- Decreases False Alarms
Benefits

- Enables Non-intrusive Inspection
- Improves Inspection Speed
- Provides Fast Data Reporting
- Reduces Leak Survey Costs
Optical Infrared Absorption Method

Easy to Use – No Extensive Training Required
Direct Assessment without Digging

Quick Spot Check on Permanent Installations

Installations Over Waterways for Monitoring Underwater Pipe
duoThane™ Airborne

- Flies on Fixed Wing and Rotary Aircraft
- Augments Airborne Vegetation Surveys
- Identifies Gas Concentration along with GPS Leak Position Reporting
- Flight Demonstration Slated for Q1 ‘04
Market Opportunity

- The Natural Gas Industry is Large and Growing
  - $130 Billion/year
  - 60 Million Customers
  - Natural Gas Demand is Growing
  - Clean Burning Fuel of the Future
  - “Integrity Monitoring” Regulations Changing the Industry
Future Markets

◆ Liquid Pipelines
  ◆ Crude Oil, LPG, Gasoline, Propane, etc.
    ▪ Contribute to ~70% of all property damage produced by liquid pipelines in the U.S.
  ◆ Most Expensive Type of Pipeline in U.S.
  ◆ duoThane™ employed in Ground-based, Long-term Monitoring Configuration
dquoThane” Development Status

- Prototype Demonstrations Completed
- Field Tests Completed
  - El Paso, WBI, Alyeska, EPA test, U.S. DOE test, Private Oil & Gas Exploration Company
- Operational Natural Gas Pipeline Leaks
  - Three Levels of Leak Severity Demonstrated
  - Range of ~300 m (~980 ft)
Glendive, MT Test Data
El Paso Demonstration

- First Demonstration of Detecting and Measuring Actual Leaks in the Field
- General Agreement Between FID Data and duoThane™ Data
  - Measurement Techniques
  - Measurement Location
- Measured Both Methane and Ethane Concentrations, not Just Total Hydrocarbons
Alyeska Demonstration

- First “Oil on Water” Test
- First Atmospheric Methane and Ethane Measurements over Active Natural Seeps
  - Santa Barbara Channel, CA
- Shipborne and Pier Measurements
  - 27 m (88 ft.) pathlength – ship measurement
  - 460 m (1,500 ft.) – pier measurement
Alyeska Demonstration, cont.

- Santa Barbara Channel
Alyeska Demonstration (cont.)

10/14/2003, 101403-100609, concentration vs. time, plotted on: 16-Oct-2003

~90 ppm methane

~9 ppm ethane
Development Status

- ~$370,000 Already Expended in R&D
  - U.S. EPA, U.S. DOE, Ophir Corporation
- $600,000 Awarded for Flight Test Demonstration
  - U.S. DOE/NETL funding
  - Flight Test Demonstration in 4 Months
- Demonstration Over Operational Pipeline Completed – WBI, Inc., El Paso
- Demonstration Over Oil on Water - Alyeska
Intellectual Property

- **U.S. Patent Application Filed**
  - Optical Remote Sensing Technology and Hardware
  - May 25, 2002

- **U.S. Provisional Patent Application**
  - Optical Remote Sensing for Pipeline Integrity Monitoring

- **U.S. Registered Trademark Awarded**
Commercialization Plans

- Demonstrate validity of system as integrity monitoring alternative to meet legislated requirements
- Manufacture **duoThane™** product in-house at Ophir
- Distribute product via established leak detection product/service company

*Ophir is actively seeking an Industry Partner to assist in bringing **duoThane™** to Market*
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