

**Innovative  
Methane and Ethane  
Leak Detection Tool**

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Ophir Corporation

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# Overview

- ◆ Introduction to Ophir Corporation
- ◆ Ophir's *duoThane*<sup>TM</sup> 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*<sup>TM</sup> Benefits

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

# *duoThane*<sup>TM</sup> **Benefits**

- ◆ Enables Non-intrusive Inspection
- ◆ Improves Inspection Speed
- ◆ Provides Fast Data Reporting
- ◆ Reduces Leak Survey Costs



# duoThane™

- ◆ Optical Infrared Absorption Method
- ◆ Easy to Use – No Extensive Training Required



**duoThane™**

# Ground-based

- ◆ Direct Assessment without Digging
- ◆ Quick Spot Check on Permanent Installations
- ◆ Installations Over Waterways for Monitoring Underwater Pipe



# *duoThane*<sup>TM</sup> 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**<sup>™</sup> employed in Ground-based, Long-term Monitoring Configuration

# **duoThane<sup>TM</sup> Development Status**

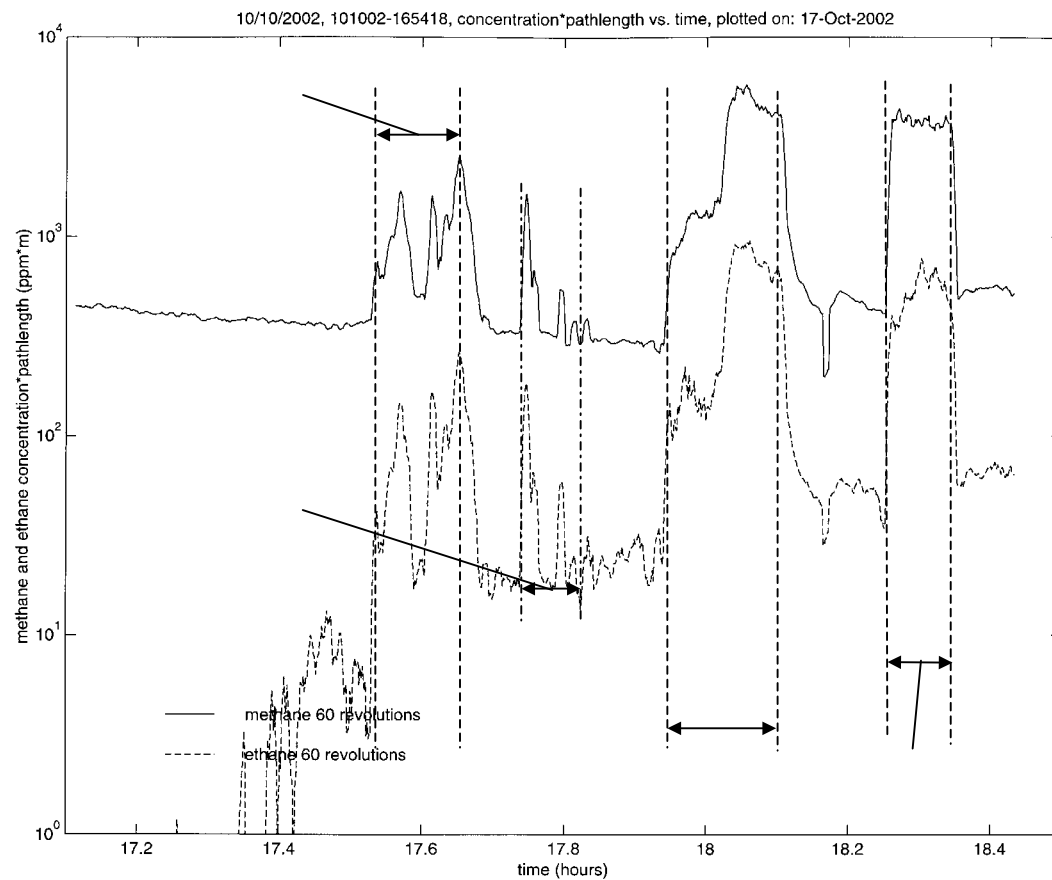
- ◆ Prototype Demonstrations Completed
- ◆ Field Tests Completed
  - El Paso, WBI, Alyeska, EPA test, U.S. DOE test, Private Oil & Gas Exploration Company
- ◆ Operational Natural Gas Pipeline Leaks
  - ◆ Three Levels of Leak Severity Demonstrated
  - ◆ Range of ~300 m (~980 ft)



# Operational Pipeline Demonstration



# Glendive, MT Test Data





# El Paso Demonstration

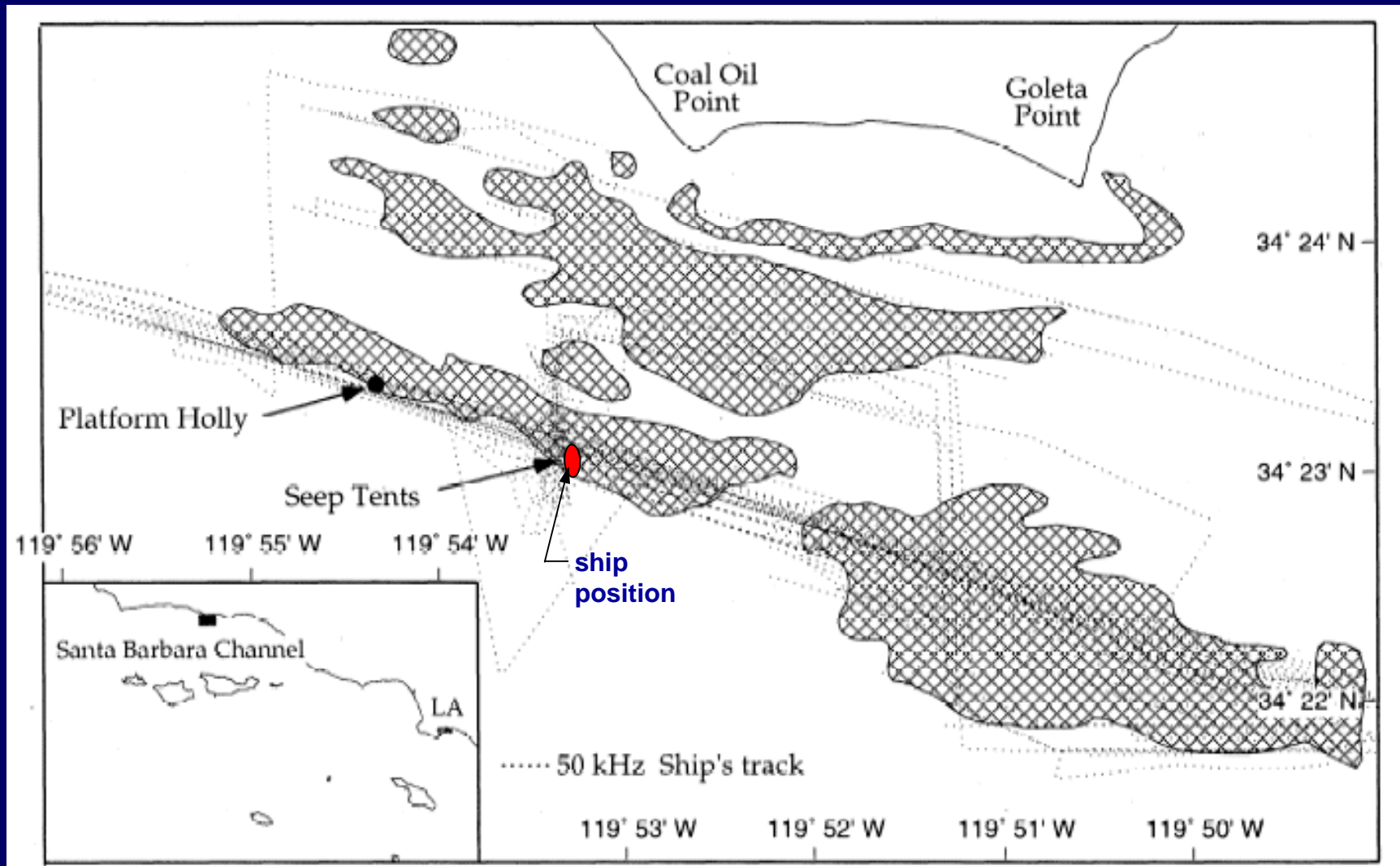
- ◆ First Demonstration of Detecting and Measuring Actual Leaks in the Field
- ◆ General Agreement Between FID Data and *duoThane*<sup>TM</sup> Data
  - Measurement Techniques
  - Measurement Location
- ◆ Measured Both Methane and Ethane Concentrations, not Just Total Hydrocarbons

# Alyeska Demonstration

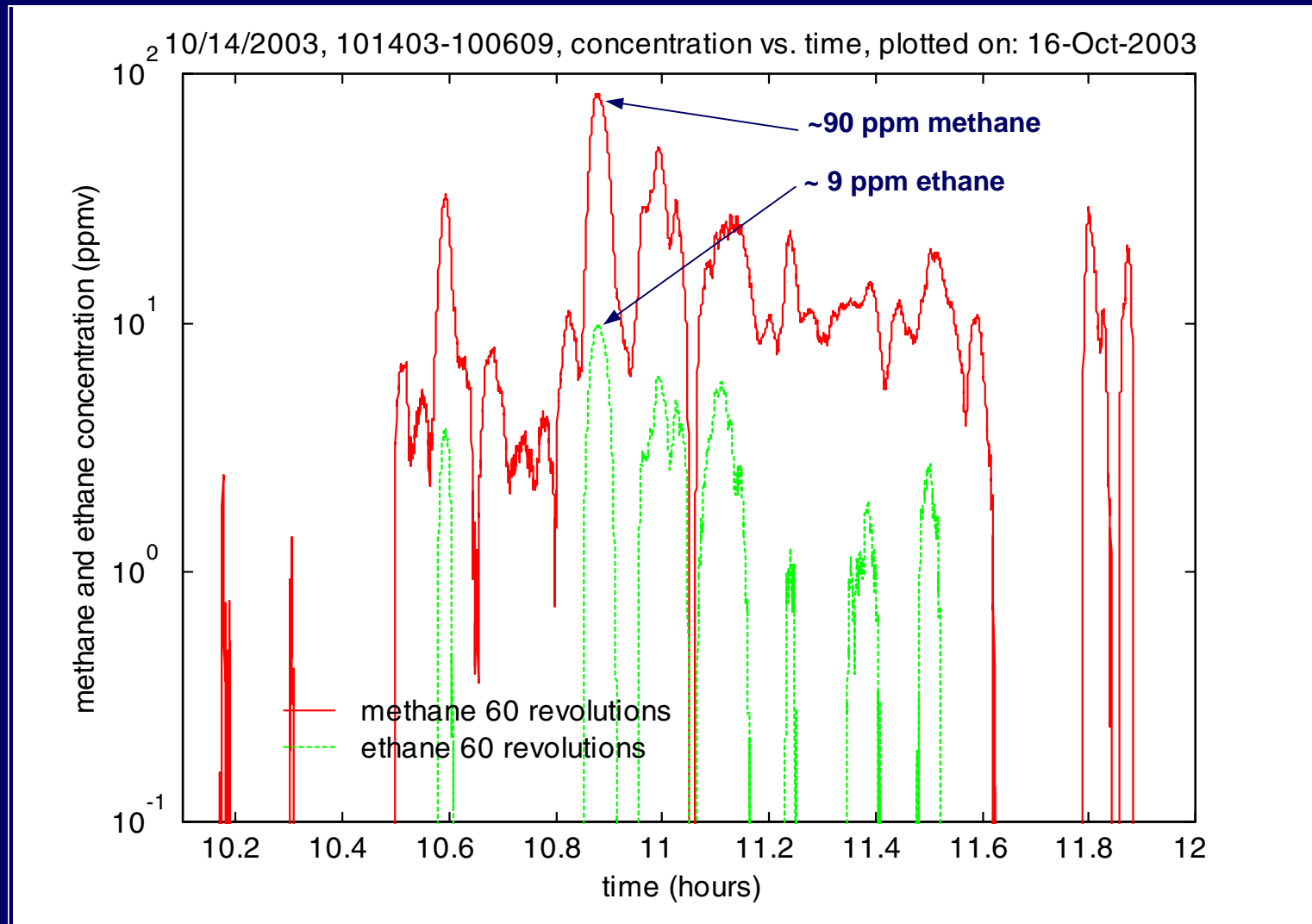
- ◆ First “Oil on Water” Test
- ◆ First Atmospheric Methane and Ethane Measurements over Active Natural Seeps
  - ◆ Santa Barbara Channel, CA
- ◆ Shipborne and Pier Measurements
  - ◆ 27 m (88 ft.) pathlength – ship measurement
  - ◆ 460 m (1,500 ft.) – pier measurement

# Alyeska Demonstration, cont.

## ◆ Santa Barbara Channel



# Alyeska Demonstration (cont.)



# **duoThane<sup>TM</sup>** 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**<sup>TM</sup> 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**<sup>TM</sup> to Market*

# Contact Information

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