Quarterly Report

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Project Title:	"Consolidated Research and Development for Pipeline Safety"
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Public Page

The program will investigate the feasibility of using a remotely piloted underwater vehicle with commercially available sensors to improve the capability to monitor subsea pipelines to address the needs of the Industry and Government Regulatory organizations to enhance the efficiency and safety of subsea pipeline facilities and operations. This initial phase of the program is to determine the current capability and needs for subsea pipeline surveillance and monitoring in order to choose appropriate sensors for demonstration trials.

The currently funded effort is limited to the selection of commercially available sensors which may be rapidly integrated to existing UUV platforms to demonstrate an enhanced subsea pipeline surveillance capability. This initial report is an effort to define the "mission requirements" for this enhanced capability demonstration.

There is very little commercial or regulatory requirement at present for subsea pipeline surveillance except during installation of the pipe or following possible encroachment incidents such as anchor dragging near or over pipeline routes. These types of surveillance tasks require a capability to detect new foreign bodies dropped near the pipeline, bottom disturbances from anchor drags near or across a pipeline, and misalignment or damage to unburied pipelines.

This program will use available Unmanned Underwater Vehicles (UUVs) and sensor technologies to demonstrate a cost effective system solution to conduct sub-sea surveillance of pipelines, thereby closing existing gaps in safety, inspection and enforcement while reducing cost. Research conducted this quarter focused on six topics:

- Identification of pipeline sub-sea surveillance missions
- Identification of applicable Federal sub-sea surveillance regulations
- Identification of additional pipeline owner/operator operational requirements
- Determine data acquisition requirements
- Determine ROV payload requirements
- Determine vehicle requirements

Applicable Federal Regulations

Department of Transportation
Office of Pipeline Safety
Mission Statement:
To ensure the safe, reliable & environmentally sound operation of the nation's pipeline transportation system.

According to the DOT/OPS website, Federal regulations require companies to perform maintenance inspections on pipeline components at specified intervals. Inspection requirements specified in the Federal pipeline safety regulations.

Excerpts from applicable regulations follow:

[Code of Federal Regulations]
[Title 49, Volume 3]
[Revised as of October 1, 2004]

From the U.S. Government Printing Office via GPO Access
[CITE: 49CFR192.612]

TITLE 49--TRANSPORTATION

CHAPTER I--RESEARCH AND SPECIAL PROGRAMS ADMINISTRATION, DEPARTMENT OF TRANSPORTATION (CONTINUED)

PART 192_TRANSPORTATION OF NATURAL AND OTHER GAS BY PIPELINE: MINIMUM FEDERAL SAFETY STANDARDS--Table of Contents

Subpart L_Operations

Sec. 192.612 Underwater inspection and reburial of pipelines in the Gulf of Mexico and its inlets.

(a) Each operator shall prepare and follow a procedure to identify its pipelines in the Gulf of Mexico and its inlets in waters less than 15 feet (4.6 meters) deep as measured from mean low water that are at risk of being an exposed underwater pipeline or a hazard to navigation. The procedures must be in effect August 10, 2005.

(b) Each operator shall conduct appropriate periodic underwater inspections of its pipelines in the Gulf of Mexico and its inlets in waters less than 15 feet (4.6 meters) deep as measured from mean low water based on the identified risk.

(c) If an operator discovers that its pipeline is an exposed underwater pipeline or poses a hazard to navigation, the operator shall--

(1) Promptly, but not later than 24 hours after discovery, notify the National Response Center, telephone: 1-800-424-8802, of the location and, if available, the geographic coordinates of that pipeline.

(2) Promptly, but not later than 7 days after discovery, mark the location of the pipeline in accordance with 33 CFR part 64 at the ends of the pipeline segment and at intervals of not over 500 yards (457 meters) long, except that a pipeline segment less than 200 yards (183 meters) long need only be marked at the center; and

(3) Within 6 months after discovery, or not later than November 1 of the following year if the 6 month period is later than November 1 of the year of discovery, bury the pipeline so that the top of the pipe is 36 inches (914 millimeters) below the underwater natural bottom (as determined by recognized and generally accepted practices) for normal excavation or 18 inches (457 millimeters) for rock excavation.

(i) An operator may employ engineered alternatives to burial that meet or exceed the level of protection provided by burial.

(ii) If an operator cannot obtain required state or Federal permits in time to comply with this section, it must notify OPS; specify whether the required permit is State or Federal; and, justify the delay.

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Subpart L_Operations

Sec. 192.613 Continuing surveillance.

(a) Each operator shall have a procedure for continuing surveillance of its facilities to determine and take appropriate action concerning changes in class location, failures, leakage history, corrosion, substantial changes in cathodic protection requirements, and other unusual operating and maintenance conditions.

(b) If a segment of pipeline is determined to be in unsatisfactory condition
but no immediate hazard exists, the operator shall initiate a program to recondition or phase out the segment involved, or, if the segment cannot be reconditioned or phased out, reduce the maximum allowable operating pressure in accordance with Sec. 192.619 (a) and (b).

Data Requirements

Data will be presented in the form of written reports, photographs and video imaging.

Payload Requirements

The ROV system selected will be capable of carrying a range of commercially available payloads including black and white or color still digital imaging cameras and low light level video cameras and a host of environmental sensors. In addition, scanning digital sonar looks like a promising technology for high resolution acoustic imaging with greater range than that possible with optical sensors. Positioning of the sensors can be done by inertial systems and acoustic positioning tied to a Global Positioning System (GPS) on the surface support platform. Concurrent data acquisition and processing displays in near real-time is desired feature for the selected sensors.

Table 1.0 - Payloads

SIT video
Digital still camera
Digital Scanning Sonar
USBL positioning
IMU
GPS (surface vessel)
Compass heading

Other Environmental Sensors (TBD)

Vehicle Requirements

The proposed UUV is a commercial marine design consisting of a remotely operated vehicle operated from a surface vessel. The ROV approach allows a real-time transmission of high band width data such as that provided by video and sonar. This is possible due to the fiber optic elements in the ROV umbilical to the surface ship. Autonomous underwater vehicles can only transmit data acoustically which is at very low bod (900 is typical) rates.

The ROV selected will be one which has extra ports and telemetry capacity available to add the demonstration sensors. Oceaneering has reviewed this with our ROV operations group and found two classes of work-class ROV's which are deemed suitable for these trials.

Figure 1: Possible ROV for use in pipeline surveillance missions