

# Overcoming the challenges of transition zone operations in Cameroon - A unique environment for 3D seismic acquisition

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Cameroon is situated on Africa's central west coast along the Gulf of Guinea, a prolific area with several known discoveries. It has three major basins - Douala, Rio del Rey, and Logone Birni - with proven reserves of approximately 98 million barrels of oil and 135 billion cubic feet of natural gas. Although Cameroon is positioned nicely to become an epicenter for the oil and gas industry in sub-Saharan Africa, there are many challenges associated with operating in a developing country. For example, there are over 24 spoken languages and approximately 250 ethnic groups that form five major regions in the country, each with different customs, cultures, laws and regulations. For a geophysical service provider, understanding the unique challenges of the country is imperative for successful data acquisition. It requires careful upfront planning and coordination with government and local resources to ensure the proper safety and management of the crew and equipment.

Africa has been an exploration hotspot for the oil and gas industry for decades, but surprisingly it remains relatively underexplored for hydrocarbons. With proven oil reserves at an estimated 117 billion barrels and approximately 14 trillion cubic feet of natural gas, the continent is ripe with opportunity for those companies willing to accept the challenges of operating in a developing market. Challenges that range from diverse environments and terrains including beaches, mountains, rainforests, and deserts to managing the logistical complications of countries with limited infrastructure for transporting goods and supplies. There are also a variety of economic and political climates that contrast dramatically from one region to the next creating areas that can often pose a threat to the safety of workers. Add to this a lack of hydrocarbon support in the form of pipelines, refineries and essential hardware necessary for transporting, processing, and converting the resources into useable energy, and you are in the melting pot of what is today's exploration dynamic in Africa.

Although currently five countries - Nigeria, Angola, Algeria, Egypt, and

Libya - represent an estimated 85% of Africa's upstream production, there are several other frontier countries, particularly those along the Gulf of Guinea, that have the potential to become major contributors as new seismic exploration helps further define new and existing hydrocarbon reserves. One of these countries is Cameroon, which has a long and impressive exploration history dating back to the 1950s.



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## Understanding Cameroon

Cameroon is situated on Africa's central west coast along the Gulf of Guinea, a prolific area with several known discoveries, and is largely a commodity-driven country heavily dependant upon oil products and agricultural exports to generate most of the annual gross domestic product. As demonstrated by the 2004 completion of the Chad-Cameroon Pipeline, a \$3.5 billion, 670-mile project utilized to transport resources to the port of Kribi from Chad, the country is situated to play an integral part in the future of Africa's oil and gas industry. The completion of the pipeline positions Cameroon to become a major transport center and further supports

## Geophysics

the nation's oil production as the fifth largest producer in sub-Saharan Africa.

Cameroon has three major basins - Douala, Rio del Rey, and Logone Birni - with proven reserves of approximately 98 million barrels of oil and 135 billion cubic feet of natural gas. Although some industry experts believe Cameroon has been well explored, there is renewed interest in the region as evidenced by recent activities, particularly in the Douala Basin where 40% of the 14 new-field wildcat wells drilled since 2002 were positive for hydrocarbons. In addition, the 2006 long-awaited Greentree Agreement, which settled an extensive dispute between Cameroon and Nigeria, opened additional blocks for lease in the Bakassi Peninsula, an area thought to be rich with hydrocarbon potential because it is surrounded by areas of significant discovery. Also, the government has established new laws and regulations to provide exploration incentives and tax breaks to stimulate foreign investment in the country in an effort to slow a 20-year steady decline of domestic oil production.

### Operating in a Challenging Environment

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Maurice Flynn, Senior Vice President of Seismic Operations for Terraseis, one of the fastest growing providers of geophysical data acquisition services headquartered in Dubai, comments, "Typically, we strive to partner with in-country service providers to solicit advice and gather information about the area for a period of several weeks before an acquisition begins. We offer our clients a turnkey solution that includes management and coordination of the complicated logistics associated with delivering heavy equipment, trucks, sometimes boats, and personnel into the region. Understanding the intricacies of the surrounding areas helps us organize a project with adequate security, fresh water supplies, transportation, housing, and all of the essentials required to conduct an onsite three to four month project under strict compliance with HSE standards."

In addition to the logistical preparation, designing the survey requires in-depth knowledge of the terrain, climate, environment, and local surroundings to successfully manage obstacles and impediments that could potentially limit the acquisition from meeting the imaging and production objectives. This is perhaps the most critical phase of the project because it determines how the operation will be executed once the crew and equipment have arrived in-country. The design establishes the equipment and technology requirements, the spacing intervals of sources and receivers, and the type of acquisition - vibroseis, dynamite, airgun, or mixed-mode - based on the terrain. In Cameroon, the terrain can vary significantly from mangrove and rainforests to deserts and savannah to mountains and foothills. For seismic acquisition, challenging terrain can be daunting as it requires versatility from the acquisition equipment to accommodate the various environments.

Perhaps the most challenging operating environment in Cameroon for seismic acquisition is the shallow transition zone area that encompasses onshore to approximately 100 meters in water depth offshore. The coastal region of Cameroon is considered one of the wettest places on earth and has a short, dry season characterized by severe heat and humidity. Along the coastline, fishing is the main industry and thousands of



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indigenous fishermen patrol the shoreline in a variety of boats to participate in the lucrative business. Conducting a survey in the Cameroon transition zone requires ingenuity and adaptability from the crew to accommodate a variety of environments, traffic, and security challenges.

**A Successful Transition Zone Operation**

Terraseis recently completed a complicated 3D transition zone survey along the Bakassi Peninsula for a major European independent oil and gas exploration and production company with a primary focus on Africa and the Middle East. It was a considerably challenging project that was initially undertaken by another international contractor who was forced to discontinue the job one day before it was scheduled to begin due to a significant security incident. Terraseis's client looked to Terraseis for support as they resumed the acquisition. Security for the crew and equipment was of utmost importance for the remainder of the project. To ensure crew safety and provide continuous surveillance, Terraseis worked closely with the client's local security advisor and

coordinated with the local Cameroon security providers. This allowed the crew to operate more efficiently while providing jobs to several residents.

The 53-day survey covered approximately 157 square kilometers in a transition zone environment. Data was acquired on land and in water with strong currents, where the Rio del Rey converges with the Gulf of Guinea. The single integrated survey included shallow saltwater beach and surf zones with up to 9 meters of water depth and a chain of islands surrounded by dense mangrove swamp. The Bakassi Peninsula also supports a local fishing economy resulting in more than 35,000 fishermen and 7,000 boats in the area throughout the duration of the survey.

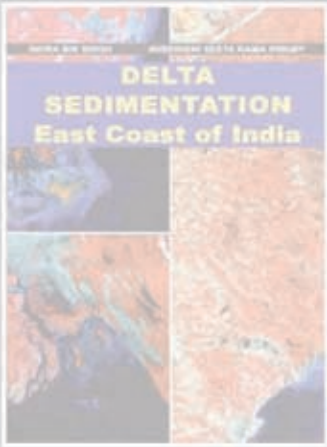
"This particular survey was unique in that we literally mobilized a crew, trained them on new transition zone equipment, and began acquiring data within ten days from arriving in Cameroon," explained Jim Gregory, Operations Manager, Terraseis.

Because transition zone acquisition is labor intensive and time consuming, a crew's experience and equipment knowledge can directly correlate with their pro-

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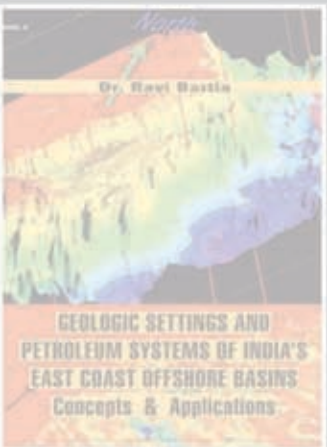
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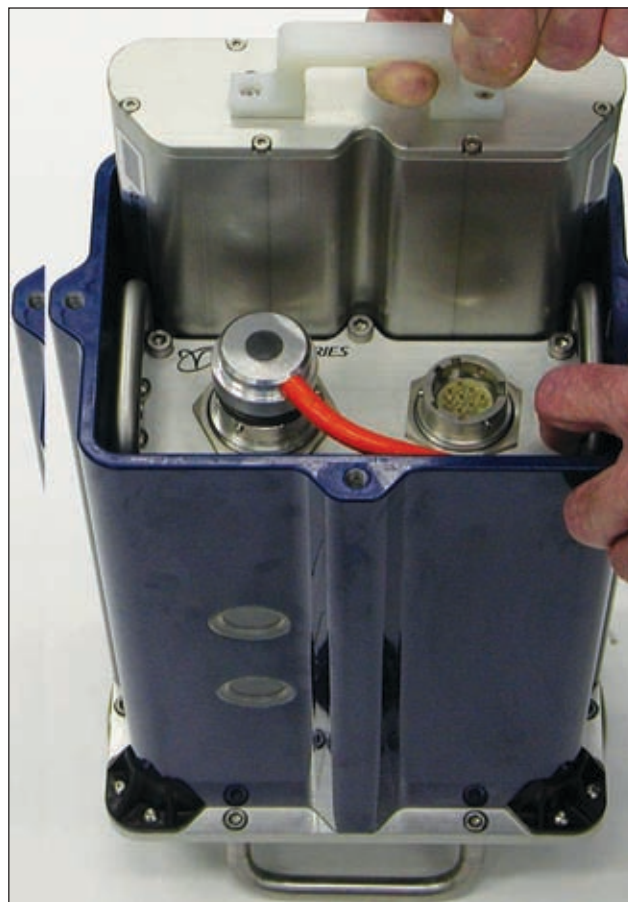
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ductivity and determine the profitability of the acquisition. In the case of the Terraseis project, the crew was required to utilize ION's Aram equipment that was already mobilized and on site, provided by their competitor. It was the first time the crew had worked specifically with ION's dual-purpose ARIES land transition zone system, a specially designed, versatile system that utilizes land ground electronics in a watertight case capable of operating in up to 75 meters of salt or fresh water. Simple adaptors allowed the crew to "transition" from lightweight land operations to watertight shallow marine operations. To help the crew overcome the strong currents in the area that can potentially move equipment out of position, the ARIES Marine Case and cables are designed with additional weight to withstand pressure from increas-



**ION's dual-purpose ARIES land transition zone system is a specially designed, versatile system that utilizes land ground electronics in a watertight case capable of operating in up to 75 meters of salt or fresh water**

ing water depths and remain stationary on the bottom eliminating obstructions to local surface traffic.

"This was our first acquisition utilizing an ARIES recording system. Our crew was able to easily deploy and retrieve the equipment, while the reliability of the system proved critical to our productivity. To have a unique land acquisition system that can operate in both land and transition zone environments with the same ground electronics reduced our overhead and operational costs. We were able to gather 9.4 million traces in a little over two months while operating unfamiliar equipment. That's a testament to our crew's ability to quickly adapt to the new system, and achieve stellar performance in a difficult environment," said Kevin Plintz, Chief Executive Officer of Terraseis. [dewjournal.com](http://dewjournal.com)