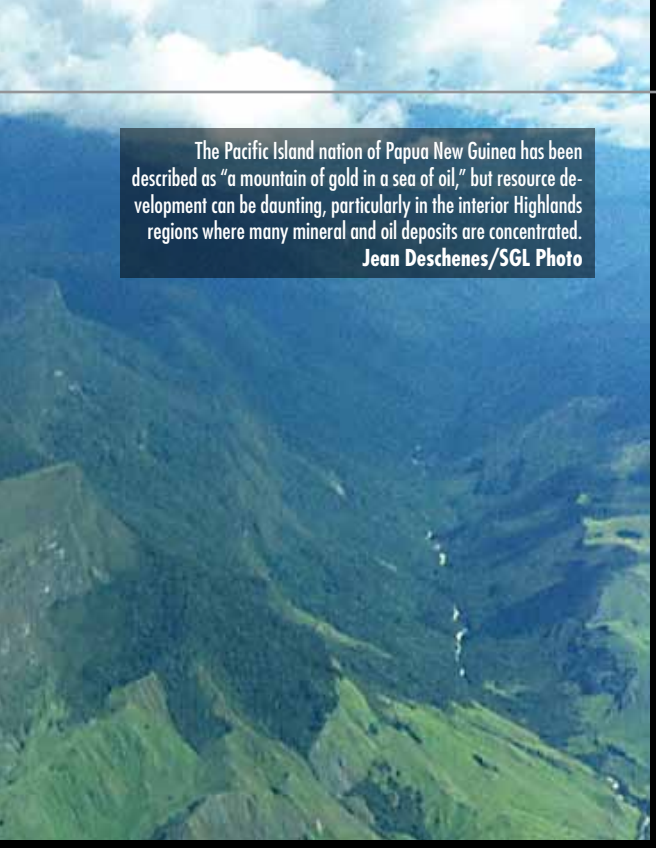
SURVEYING?



The Pacific Island nation of Papua New Guinea has been described as "a mountain of gold in a sea of oil," but resource development can be daunting, particularly in the interior Highlands regions where many mineral and oil deposits are concentrated. **Jean Deschenes/SGL Photo**

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Canada's Sander Geophysics Ltd. (SGL) has done survey work on every continent in the world, including Antarctica. Here, the company's Cessa Grand Caravan flies over PNG. **Andrew Palmer/SGL Photo**

CANADIAN AIRBORNE GEOPHYSICAL SURVEY COMPANY CHARTS NEW TERRITORY IN PAPUA NEW GUINEA

BY ELAN HEAD

In 2009, ExxonMobil and six joint venture partners launched PNG LNG, a liquefied natural gas development project in Papua New Guinea (PNG) that encompasses multiple gas production and processing facilities connected by more than 700 kilometres of pipelines. If all goes as planned, first deliveries from the project will begin this year. Now estimated at US$19 billion, PNG LNG is the largest investment project in the country's history, but it's not the only one. Encouraged by ExxonMobil's investment, oil-and-gas companies have been pursuing additional exploration and development projects throughout PNG, contributing to one of the largest resource-sector booms the country has seen in years.

The Pacific Island nation of PNG (which occupies the eastern half of the island of New Guinea, directly north of Australia's Cape York Peninsula) has been described as "a mountain of gold in a sea of oil," and the mining and oil-and-gas industries have long been major contributors to the country's economy. But resource development in PNG can be daunting, particularly in the interior Highlands regions where many mineral and oil deposits are concentrated. Imagine the Canadian Rockies covered in soggy, triple-canopy rainforest and you'll get an idea of how difficult it is to tackle construction projects in PNG. Indeed, simply moving through the Highlands is so difficult that some large societies there went unnoticed by outsiders until the 1930s, despite decades of colonial occupation of the island.

New resource projects aren't undertaken casually in PNG, and before investing the tens of millions of dollars that even an exploratory drilling project requires, resource companies try to stack the odds in their favour. This is where companies like Ottawa, Ont.-based Sander Geophysics Ltd. (SGL) come in. Founded in 1956, SGL provides worldwide airborne geophysical surveys for, among other purposes, petroleum and mineral exploration — giving resource companies guidance on where to drill for the best possible results. SGL has worked on every continent in the world, including Antarctica, and has operated in PNG periodically over the years at the request of specific customers.

Now, recent investments in PNG have encouraged SGL to make an investment of its own. For the past several months, SGL has been pursuing a special project in the country: a high-resolution gravity and magnetic survey of a large area of PNG's Western Highlands. Rather than operating on behalf of a particular customer as it usually does, SGL is self-funding this project. It will make the data available to prospective customers once the survey is complete, which should be by the middle of this year. "There are specific clients that would be interested in the area we're flying," said Andrew Palmer, an SGL project manager and senior geophysicist involved with the survey.

Scattered low-level clouds can slow aerial surveying work. A project that would ordinarily take a matter of weeks to complete can turn into a labour of months. **Dan Sweet Photo**

> “SGL HAS BEEN PURSUING A SPECIAL PROJECT: A HIGH-RESOLUTION GRAVITY AND MAGNETIC SURVEY OF A LARGE AREA OF PNG’S WESTERN HIGHLANDS.”

SGL crews typically rotate on a 60-days on, 30-days-off schedule in PNG. **Elan Head Photo**

Resource exploration and development is ongoing in PNG. **Dan Sweet Photo**

Extra fuel is a standing order when flying in PNG. The Caravan can carry as much as eight-and-a-half hours’ worth of fuel when required. **Jean Deschenes/SGL Photo**

DID YOU KNOW? DR. GEORGE W. SANDER FOUNDED SGL IN 1956 TO PROVIDE GROUND GEOPHYSICAL SURVEYS. THE FIRST AIRBORNE SURVEYS WERE PERFORMED AS EARLY AS 1958, AND BY 1967 AIRBORNE GEOPHYSICAL SURVEYS WERE THE COMPANY'S MAIN FOCUS.

IN THE FIELD

In November 2013, *Canadian Skies* visited SGL's field team in Mount Hagen, the capital of Western Highlands province, where the company had based the Cessna Grand Caravan it is using for the project. The airplane is one of eight Caravans in SGL's fleet (which also includes a de Havilland DHC-6 Twin Otter, three Diamond DA-42 Twin Stars, a Cessna 404 Titan, two Britten-Norman BN2B-21 Islanders, and two Airbus Helicopters AS350 B3 AStars). Like SGL's other aircraft, the Caravan in PNG has been extensively modified to accommodate SGL's proprietary survey equipment, including a long, cylindrical magnetometer "stinger" attached to the aircraft's tail, and an AIRGrav (Airborne Inertially Referenced Gravimeter) system installed in the cabin. Additional modifications have been made to minimize the aircraft's magnetic field, reducing interference during survey operations. (SGL has acquired numerous supplemental type certificates over the years and is a Transport Canada-approved aircraft maintenance organization, which allows it to perform most of its modifications in-house.)

SGL's airborne geophysical surveys typically involve flying low and slow over the terrain being surveyed, following the contours of that terrain as closely as possible. In PNG, however, the Highlands terrain is so dramatically rugged that SGL is instead flying a "loose drape" survey, which smooths out elevation changes much as an enormous blanket draped over the survey area would. The flying altitude for this drape survey varies according to local terrain and weather conditions; although typical survey altitude is around 150 metres (492 feet) above ground level, mountainous terrain and fog will push it higher for this survey. "We've been trying to fly as close to the ground as possible . . . but here, because of the known issues with the weather, we've been more conservative with the drape," said Palmer.

SGL's pilots typically rotate on a 60-days-on, 30-days-off schedule; when *Skies* visited Mount Hagen, pilots Shawn Cowan and Matt Gillespie were assigned to the project (along with Palmer and aircraft maintenance engineer Michael Schwartz). Having a two-pilot crew is standard practice for the company, as it allows one pilot to focus on terrain and obstacle avoidance while the other monitors the aircraft and survey equipment (which automatically records survey data directly onto a flash drive, eliminating the need for a geophysicist to ride along). Although the two-pilot structure provides an opportunity to bring up low-time pilots, the flying environment in PNG demands experience, and both Cowan and Gillespie are senior captains for the company. "In places like this, we always like to have two experienced pilots flying," explained Palmer.

There are a number of factors that make operating in PNG some of the most difficult flying in the world, one of which is the country's general remoteness. Despite the importance of aviation to the country's economy, many types of aviation infrastructure—such as airports with instrument approaches—are woefully lacking in PNG. Combine that with an overall shortage of emergency landing areas due to the thick cover of rainforest, and it's evident that fuel and alternates must be planned with care. "We generally carry a lot more fuel than we actually need," said Gillespie, noting that the Caravan can carry as much as eight-and-a-half hours' worth of fuel on board when required. "In these conditions, we like to be conservative." All of SGL's aircraft are equipped for satellite flight following, and pilots carry a generous survival kit and personal emergency locator beacons, in addition to the aircraft's emergency locator transmitter.

Perhaps the most challenging aspect of flying in PNG, however, is its unpredictable weather, compounded by a shortage of reliable weather reporting stations. The rain, fog and low clouds that are common in the Highlands pose difficulties for any operation, but have

SGL's Caravan has been extensively modified to accommodate the company's proprietary survey equipment, including a long, cylindrical magnetometer "stinger" attached to the aircraft's tail, and an AIRGrav (Airborne Inertially Referenced Gravimeter) system installed in the cabin. **Elan Head Photo**

been particularly burdensome for SGL, which must conduct all of its survey flying low-level under visual flight rules. "In good weather, you could get this done fairly quickly," Cowan said of the survey's planned 29,000 line kilometres. However, with even scattered low-level clouds able to prevent productive work on the project, a survey that would ordinarily be a matter of weeks has turned into a labour of months. "From my perspective, this is the worst place I've been to in terms of weather," Palmer told *Skies*.

SGL's operations can obviously require patience from its employees. They also require a sense of adventure, as the company routinely operates in regions, like PNG, that many Canadians would find isolating and intimidating. "Doing this type of work presents its own kind of challenges," admitted Palmer," but people who do this job really enjoy the travel. I think everyone enjoys the chance to see the world and places you otherwise wouldn't see."

Elan Head is an FAA Gold Seal flight instructor with helicopter and instrument helicopter ratings. She holds commercial helicopter licences in the U.S., Canada and Australia, and is also an award-winning journalist who has written for a diverse array of magazines and newspapers since the late-1990s.