AIRBORNE GEOPHYSICAL SURVEYS

SINGAPORE • CANADA • INDIA • SOUTH AFRICA

A Neterwala Group Company

AIRBORNE GRAVITY

An Airborne Gravity Survey is conducted with a stabilized gravity meter installed on a fixed-wing aircraft, flown over a given area measuring the earth's gravity field. The data acquired on such a survey may be used to:

- infer the location of the thickest sedimentary section
- delineate basin outlines and boundaries
- define plate tectonic structures
- locate and detail map sedimentary basins for oil and gas (salt diapir identification, assisting seismic survey planning, processing and model constraint).
- often map structures within the basin

Airborne Gravity surveys are usually conducted in association with a magnetic survey, which provides a very reliable and relatively precise (typically 5 percent or less of the depth below the flight level) method of determining the depth of the sedimentary basin. Geological targets detectable by McPhar's airborne gravity system are in the 2- to 3-km half-wavelength range. The key is to acquire and preserve amplitude and wavelength detail. Aeromagnetic and gravity data provide information about the main structural trends, including fault patterns and sedimentary basins that may contain a suitable suite of source, reservoir and seal rocks.

Wavelength resolution is limited by sampling interval and ultimately by wavelength filtering used to reduce noise and enhance signal. In conventional "station" gravity surveys (land gravity, micro-gravity, sea-bottom gravity) the data are not filtered, and so wavelength resolution is taken to be twice the station spacing, and station repeatability gives an estimate of amplitude resolution.

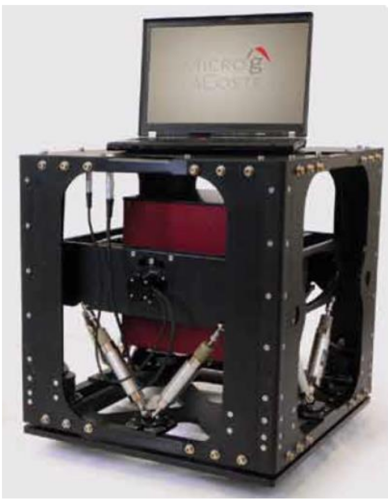
In the case of airborne gravity, practically continuous data are available along acquisition tracks so that it is the level of filtering used in processing that determines wavelength resolution; line spacing is important, but it is the level of filtering that limits spatial resolution.

Filtering is necessary to suppress short-wavelength, high-amplitude noise that would otherwise obliterate the geological signal. Remarkably, sub-milligal signal is routinely extracted from dynamic-gravity background noise levels of tens of thousands of milligals.

Dynamic gravity resolution has improved over the past few years mainly because of improved GPS positioning and the consequent improvements to instrumentation and processing. Under good conditions McPhar can achieve a wavelength resolution of about ninety seconds of flight-time, which corresponds to about 2.7 km at a typical 120-knot (approximately 220 kph, 62 metres/sec.) survey aircraft speed.

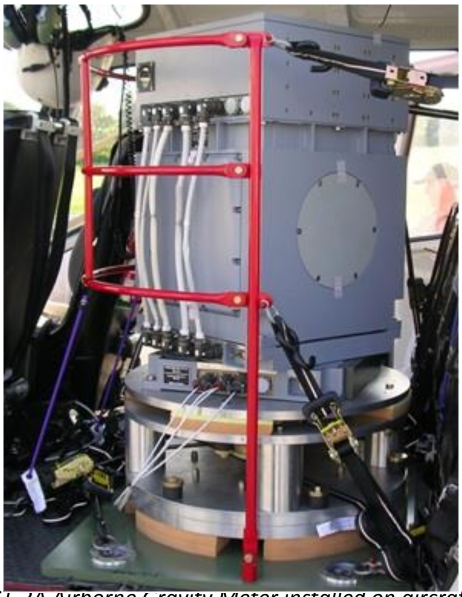
GRAVITY METERS

McPhar uses both the Micro-G LaCoste TAGS-6 dynamic gravity meter and the Canadian Micro Gravity GT-2A airborne gravity meter to undertake airborne gravity surveys. Both of these gravity meters are state-of-the-art, delivering high-quality, consistent gravity data when operated under similar climactic conditions.



TAGS-6 Dynamic Gravity Meter

The TAGS-6 is designed specifically for dynamic operations. The system incorporates a time-tested, low-drift, zero-length-spring gravity sensor mounted on a gyro-stabilized gimbal platform. The sensor has a dynamic range of ±500,000 milliGals, a resolution of 0.01 milliGals, static repeatability of 0.02 milliGals and an accuracy of 0.6 milliGals or better. Its data recording rate is 20 Hz.



GT-2A Airborne Gravity Meter installed on aircraft

The GT-2A is a vertical sensor, GPS-INS, scalar gravimeter with a Schuler-tuned three-axis inertial platform. It is designed specifically for airborne operations. The system incorporates a time-tested, low-drift, zero-length-spring gravity sensor mounted on a gyro-stabilized gimbal platform. The sensor has a a dynamic range of 1,000,000 milliGals, a resolution of 0.01 milliGals, and an accuracy of 0.5 milliGals. Its data recording rate is 20 Hz.

OTHER INSTRUMENTATION

An airborne magnetometer, typically a Scintrex CS-3 airborne cesium magnetometer with a real-time digital compensator is installed on the aircraft in a tail-stinger, providing magnetic data with a resolution of typically 0.001 nT at 10 Hz sample rate.

A geodetic quality, dual-frequency GPS receiver and GPS base station are used for aircraft navigation and data positioning. An autopilot aids the navigation task. Data acquisition is accomplished using a PC-based ruggedized datalogger. Other ancillary instruments include radar and barometric altimeters, power supplies, etc.

SURVEY AIRCRAFT

McPhar uses the twin engine Piper PA-31 Navajo and turbine engine Cessna C208B Grand Caravan to conduct airborne gravity survey operations.

The Piper PA-31 Navajo has a duration of approximately 7 hours at a speed of 120 knots (220 km/hr) when configured for gravity and magnetic surveying.

Piper PA-31 Navajo aircraft with magnetometer tail-stinger

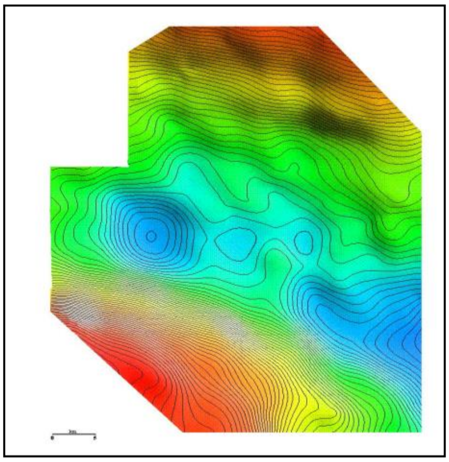
The Cessna C208B Grand Caravan has a duration of approximately 6 hours at a speed of 120 knots (220 km/hr) when configured for gravity and magnetic surveying.

Cessna C208B Grand Caravan aircraft with magnetometer tail-stinger

DATA PROCESSING & INTERPRETATION

Final data processing and interpretation is undertaken at our data processing centre, which is staffed by very experienced geoscientists and equipped with a state-of-the-art network of computers, scanners, plotters and other hardware.

The interpretation of geophysical results into meaningful geological parameters is the prime function of any of our interpreters. The highly qualified geo-physicists and technicians on our staff share a strong geological background. The manipulation of geophysical data is only a means to an end, and the final product of the interpretation is the compilation of a series of maps showing interpreted geological parameters.



Bouguer Gravity colour image of airborne gravity data