

## GRAV-D Puerto Rico and the Virgin Islands (PV09) Survey Project Report

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National Geodetic Survey (NGS)

### Executive Summary

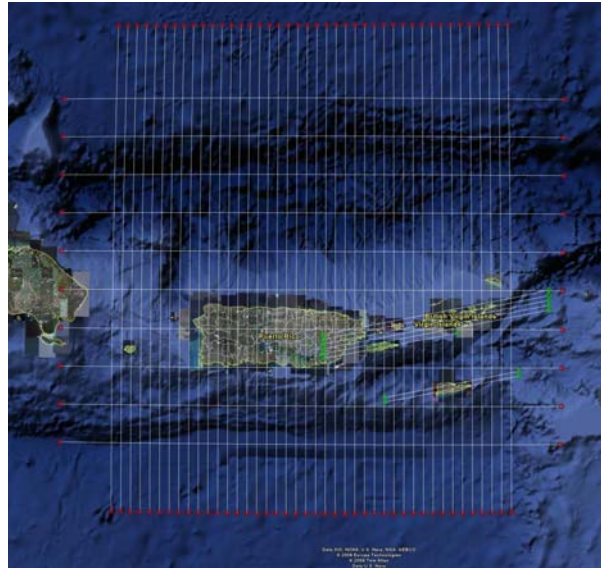
NOAA's National Geodetic Survey launched a program in FY07 called Gravity for the Redefinition of the American Vertical Datum (GRAV-D). This program is designed to replace the current national vertical datum (NAVD 88) with a datum based upon a gravimetric geoid by 2018. To produce the geoid at the needed accuracy, an airborne campaign is underway to measure the gravity field over all of the US and its holdings.

One of GRAV-D's top priorities was to collect airborne gravity data in Puerto Rico and the Virgin Islands. That survey was undertaken in January 2009 with the NOAA Cessna Citation. Operations were conducted out of two Fixed Base Operators (FBOs): Alliance Aviation at the Cyril E. King Airport (STT) on St. Thomas, Virgin Islands and Western Aviation Service Corporation at the Borinquen Airport (BQN) in Aguadilla, Puerto Rico.

The main survey was conducted over a 400 x 500 km region that encompassed Puerto Rico, the British and American Virgin Islands, and major oceanic tectonic features nearby (a subduction zone to the north and a transform boundary to the south). The work was accomplished in 91 hours with 24 flights. An small target-of-opportunity survey was also completed, at low altitude (5,000 – 6,000 ft), over the Virgin Islands in 2 flights and totaling just over 7 hours. The aircraft was equipped with an airborne gravimeter, GPS receiver, and a GPS/Inertial unit. At least one GPS base station was maintained during the survey for differential GPS positioning.

A terrestrial campaign was designed to support the airborne operation. An FG5 absolute gravimeter was sent in advance of the survey to acquire new measurements on St. Thomas, V.I. and Aguadilla, P.R. Two relative gravity instruments were then used during the airborne survey to establish gravity ties from the new absolute measurements to the aircraft parking spots at each airport.

Detailed records of airborne survey events and terrestrial measurements are included in the Appendices of this report.



## Survey Synopsis

### Survey Overview

Organization	NOAA/National Geodetic Survey
Project/Survey Name	GRAV-D/PV09
Airport Base of Operations	Cyril King Airport; St. Thomas, Virgin Islands Borinquen Airport; Aguadilla, Puerto Rico
Geographic Location	Puerto Rico and the Virgin Islands
Survey Size	400 x 500 km regular grid & few irregular lines
Dates of Airborne Operations	January 6 – 29, 2009
Team Lead/Contact Person	Dr. Vicki Childers, GRAV-D Proj. Mgr. vicki.childers@noaa.gov

### Survey Design and Execution

Line Spacing	Data Lines: 10 km Cross Lines: 40 km
Nominal Survey Altitude	35,000 ft / 10,668 m & 5,000ft / 1,524 m
Nominal Aircraft Ground Speed	280 knots
Number of Lines Completed	Data Lines: 42 Cross Lines: 10      VI Low Altitude Lines: 8
Number of Crossovers	419 (high-altitude lines only)
Total Flight Hours	98 (7 for low altitude)

### Instrumentation

Aircraft	NOAA Cessna Citation II (Tail: N52RF)
Gravity Instrumentation	Micro-g LaCoste (MGL) TAGS S-137 MGL FG5 -102 (absolute) MGL G-157 and G-81 (relative)
GPS Instrumentation	NovAtel DL-4 Plus Applanix POS AV 510 Ashtech Z-surveyor (ground survey)
Processing Software	MGL AeroGrav v1.1.8 Waypoint GrafNav v7.80.2315 MGL g7 NGS RELEN3 and RELG2D

### Data Processing

Data Version	Preliminary
Gravity Processing Filter Length	120 seconds
Nominal Spatial Resolution	17.3 km along track 20 km cross track
Datums	WGS-84, ITRF00, and EGM96

### Gravity Tie

Gravity at VI Absolute Station (mGal)	St Thomas AA: 978 663.8863 ± 0.0033
Gravity at VI Aircraft 125 cm (mGal)	STT TAGS: 978 666.5663 ± 0.0075
Gravity at PR Absolute Station (mGal)	Mayaguez AA: 978 654.5014 ± 0.0038
Gravity at PR Aircraft 125 cm (mGal)	BQN TAGS: 978 643.4729 ± 0.0106