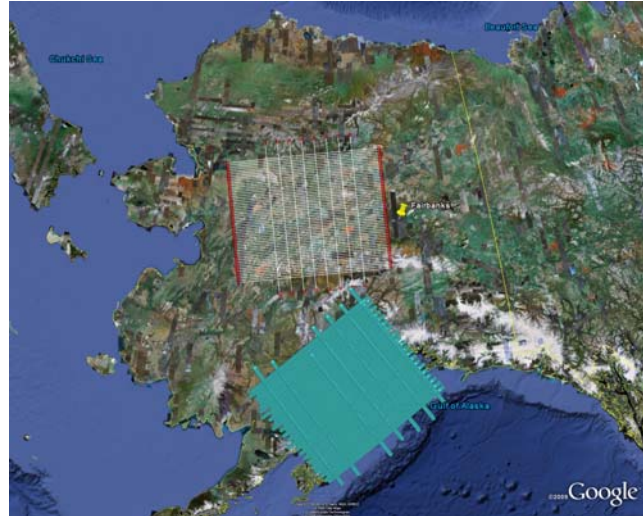


GRAV-D Central Alaska- Fairbanks (AK09) Survey Project Report

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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 within the next 15 years. 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 is to collect airborne gravity data in Alaska. This priority was assigned for two reasons: NAVD88's 1-2 m errors in Alaska and the sparse gravity data there. This report presents the operations and outcome of the second GRAV-D survey in Alaska (shown in red & white lines above). Flown in July-August 2009, the mission was funded by the National Geospatial Intelligence Agency (NGA) and accomplished upon the Naval Research Labs (NRL) RC-12 aircraft. Operations were conducted out of Eielson Air Force Base, approximately 20 miles SE of Fairbanks.

The survey was planned over a 400 x 500 km land-locked region. The area extends from the northern edge of the Alaska Range Mountains to ~66.5° N and from 115 km inland of the Bering Sea's major inlets to 50 km west of Fairbanks, AK. Due to financial and calendar constraints, the original survey plan was completed between lines 103 and 146 (omitting the southern two lines and northern eight lines). The tie lines were also shortened slightly in length. For every line, the aircraft was equipped with an airborne gravimeter, GPS receivers, a GPS/Inertial unit, and a magnetometer from the U.S. Geological Survey (USGS). At all times, at least one GPS base station was running for differential GPS positioning. The work was accomplished in 116 hours with 33 flights.

A terrestrial campaign was also designed to support the airborne operation. Existing absolute gravity measurements made by NGS in 2008 in Fairbanks, AK were used as the basis of a tie. Two relative gravity instruments were then used during the airborne survey in August 2009 to tie from the existing absolute measurement to the aircraft parking spot at Eielson Air Force Base.

Detailed records of airborne survey (Section I) and terrestrial measurements (Section II) are included in the text and appendices of this report.

Survey Synopsis

Survey Overview

Organization	NOAA- National Geodetic Survey DOD- National Geospatial Intelligence Agency
Project/Survey Name	GRAV-D/AK09
Airport Base of Operations	Eielson Air Force Base, AK
Geographic Location	Central Alaska (north of the Alaska Range)
Survey Size	400 x 500 km regular grid & tie lines
Dates of Airborne Operations	July 6 – August 12, 2009
Team Lead/Contact Person	Dr. Theresa Diehl, theresa.diehl@noaa.gov Dr. Vicki Childers, vicki.childers@noaa.gov

Survey Design and Execution

Line Spacing	Data Lines: 7.5 km Cross Lines: 37.5 km
Nominal Survey Altitude	12,500 ft / 3,810 m
Nominal Aircraft Ground Speed	220 knots
Number of Lines Completed	Data Lines: 46 Cross Lines: 7 Repeat Lines: 3
Number of Crossovers	343
Total Flight Hours	116

Instrumentation

Aircraft	Naval Research Labs RC-12 (No. 563)
Gravity Instrumentation	Micro-g LaCoste (MGL) TAGS S-137 MGL FG5 -102 (absolute) MGL G-157, G-81, and D-43 (relative)
GPS Instrumentation	NovAtel DL-4 Plus Applanix POS AV 510 Trimble R8 (base station) Ashtech Z-surveyor (base station)
Magnetics Instrumentation	Geometrics G-823 Cesium (USGS-owned)
Processing Software	Micro-g LaCoste 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	13.5 km along track 15 km cross track
Datums	WGS-84, ITRF00, and EGM96

Gravity Tie

Gravity at Fairbanks Absolute Station	CIGO-A: 982 226 898.1 ± 3.2 μGal
Gravity at Eielson Aircraft 162.5 cm	EIL TAGS: 982 202 660.3 ± 8.3 μGal