SGDrape

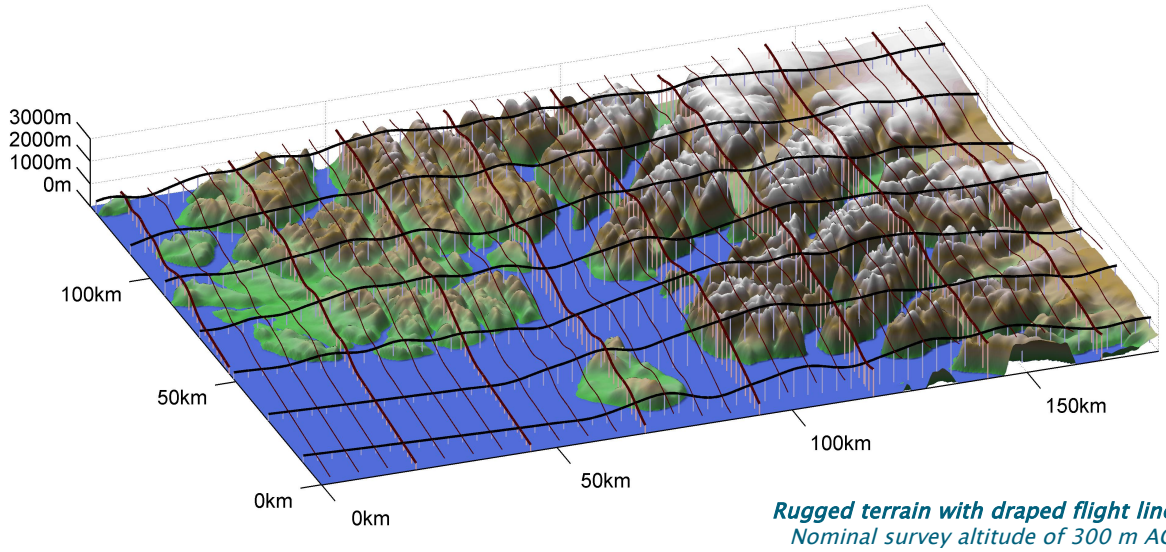
SGL's Computer-aided Drape Flying System

High resolution geophysical data require surveys to be flown at a consistent height above the ground. Also important is the survey aircraft maintaining a consistent and safe altitude on the two orthogonal survey line directions. SGL has designed and implemented a computer-assisted system, **SGDrape**, to enable the company's flight crews to maintain an optimal flight altitude (drape surface) during surveying while at the same time ensuring that primary and control lines intersect at the same altitude. Flying surveys using a drape surface is important for all types of geophysical data, particularly in hilly or mountainous terrain.

When creating a drape surface the digital terrain model is modified, reducing all slopes to within the capabilities of the survey aircraft to safely climb and descend. The drape surface is then loaded into the survey aircraft's navigation system (**SGNav**), together with the planned flight lines. As the aircraft flies along the survey lines the navigation system provides guidance to the flight crew using a modified Instrument Landing System (ILS) indicator mounted in the cockpit, and the flight crew matches the aircraft's altitude to the planned altitude for that location. Altitude information comes from Real-time Differential GPS (RDGPS), or the aircraft's radar or laser altimeter.

FLYING A DRAPE SURFACE

A typical application for **SGDrape** is shown in the diagram below, where the mountains rise out of the ocean and reach an elevation of about 2,000 m in only a few kilometres. Without the drape flying program it is difficult for the survey crew to fly adjacent and orthogonal lines at a consistent altitude. Decisions must be made as to when to start climbing while approaching a hill or ridge, how deep into a valley to descend, how steeply to descend off a ridge, and what altitude to fly when flying parallel to a ridge to enable control lines to intersect with all of the primary lines. The task of defining the correct drape altitude is much better performed by a computer using a digital terrain model, leaving the flight crew more time to fly the aircraft, watch for other aircraft and obstacles, and monitor the survey instruments. The **SGDrape** system removes the guesswork from the selection of survey altitudes in rough topography, to enhance the quality of the final data, and to improve the safety of the survey operation.



Rugged terrain with draped flight lines
Nominal survey altitude of 300 m AGL

ADVANTAGES OF SGDrape

- **Preparation of the drape surface allows for pre-survey analysis and optimization of the survey line direction, as well as a quantification of the achievable flying height over the entire survey area. This results in more efficient use of exploration dollars.**

- **Prior to survey flying clients can see what the drape surface looks like and can examine what altitude the sensors will be at over the entire survey area.**

- **Control line and traverse lines intersect at the same altitude, which facilitates data levelling.**

- **The drape system is a tool which makes flying a smooth drape much easier by extending the advantages of electronic navigation to the third dimension, allowing the flight crew to fly a better, safer survey. The system effectively takes the guess work out of maintaining a safe and consistent survey altitude.**

- **The drape surface removes significant variations in altitude between subsequent flights due to changing weather conditions (wind, visibility, temperature, etc), changing aircraft fuel loads, and different flight crews. Differences in the altitude of adjacent survey lines flown in opposite directions are also minimized.**

- **The system is not an autopilot, so the pilot is always in full control of the aircraft.**

The system also offers a significant safety advantage because the rate of climb is limited before the start of the survey operations to that which can be safely maintained by the aircraft. SGDrape reduces pilot workload and fatigue, leaving more time for the crew to attend to other flight tasks. The company continues to limit survey operations to good VFR conditions under daylight hours allowing the flight crew to maintain a careful lookout for uncharted obstacles and avoid situations where the aircraft may be unable to maintain a safe altitude and airspeed.

A digital terrain model is essential for the process. SGL endeavours to find, or create, the best digital terrain model possible. In areas of steep topography, locations and altitudes of the highest points are most important. Topography below the highest points, which is beyond the climb/descent rate of the aircraft, need only be modelled in a very general manner.