Towards a Long Term OIB Flight Planning Strategy

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The land ice acquisition strategy specifies the broad outline for designing an optimized set of flight lines that satisfy the OIB science requirements. The conceptual approach sketched here is to develop a procedure for systematically planning flights that may lend itself to more rigorous tracking between flight lines and science requirements, optimize resources, and evolve towards some level of automations. Moreover by developing a robust flight planning strategy, we will be very close to understanding what Icebridge must look like operationally over the next 5 years.

The strategy has three main elements:

I. Use depth sounding radar, low elevation lidar, gravity, accumulation radar, and possibly DMS to establish once the bedrock topography grid and ice surface sampling epoch. The approach is to provide flexibility to establish the basal topography and low-elevation surface information at any epoch.

a) Collect data along closely spaced flight lines (5 km or less) roughly parallel to elevation contours near the coast and which extend seaward of the ice margin.

b) Collect data along more widely separated flight lines (10-20 km) roughly parallel to elevation contours inland of about the 400 m/yr surface velocity contour (speed number is just a placeholder right now).

c) Collect data on flight lines along center lines of most Greenland and Antarctic glaciers and which selectively extend across the ice divide. In general it is preferable to collect coincident radar and altimeter data early in the project.

II. Using high elevation lidar and possibly DMS for extending coverage and for repeat elevation measurements

a) Fill regions between low elevation flight lines

b) Repeat acquisitions in succeeding years for dh/dt

III. Use both the extended and base data sets to construct a spatial and temporal coverage sufficient for improving ICEsat cross track slope errors, tying ICEsat and OIB data to the Cryosat data set, connecting all earlier data sets to the ICEsat-2 data set. The coverage should be sufficient to allow an assessment of regional ice sheet elevation change shortly after the start of the ICEsat-2 mission.