ARISTO-2017 Objectives Summary and Flight Requirements by Instrument

Instrument	Objective	Flight requirement
2D-C	We need multiple full atmospheric profiles (in cloud or out) to test the temperature effects, to assess whether the laser alignment holds. There is also a new fast USB interface that hasn't been tested yet.	Any clouds will be great but some drizzle conditions would be best.
2D-S	Test instrument operation on the GV in preparation for SOCRATES.	Cloud penetrations.
AVAPS	AVAPS Sonde has a major upgrade with the most significant aspect being a next generation PTH sensor unit.	Test the next generation dropsonde. Clearance to release ~25 dropsondes with the majority at high altitude, no requirements for weather but would prefer varied conditions.
CDP	Comparison of anti-shattering instrument tips performance with standard tips.	As many cloud penetrations as possible during the campaign.
CFDC	Altitudes should be as expected for SOCRATES, from surface (including flight at low level over ocean regions if possible and desired by other partners) pressure to the 400 mb pressure level. Cloudy air samples should include sampling in supercooled clouds. Test the ability to re-ice, which was compromised in the ARISTO-16 configuration. Test the transfer to and sampling from the CVI inlet.	Climb and descent rates at 1000 feet per minute and up to 2000 feet per minute would be useful to examine for their operational influence on CFDC-1H measurements. Test the re-icing procedures during at least two flights (cabin operation only). Unpolluted air aloft; lower level stratiform clouds for which sampling could be done above, below and within clouds would mimic targets from SOCRATES (excepting the aerosol scenario). Orographic wave clouds would also make appropriate targets.
CLH-2	Demonstrate that CLH-2 can be installed, monitored, and removed by a graduate student, with little or no real-time assistance from the PI. This will be our definition of "autonomous", and a successful outcome will be a complete set of data from all ARISTO 2017 flights. Want to sample in two	High altitude, dry cirrus and mid-altitude 10,000-15,000 ft mixed phase clouds.

	regimes: very high altitude, relatively cold and dry cirrus, and mid-level (10-15,000 feet), mixed-phase clouds (if possible at this time of year).	
CVI and WIBS	Supercooled and ice clouds to test the long, heated cabin line required to fly CVI together with HIAPER Cloud Radar. Test the new CVI software and test WIBS software on the CVI computer.	Testing over full range of flight altitudes, in and out of clouds. Testing of different ascent/descent rates (up to 1500 ft/min) in same location to aid in understanding potential limitations for SOCRATES.
GNI	Any. A marine near surface flight leg is desired, but not required.	Marine near-surface flight is beneficial but not required.
GPIT	Pressure and flow testing for GV pod inlet designs	Straight and level legs at various altitudes as well as controlled climbs and descents, figure 8s. Lenschow maneuvers at multiple altitudes. Flight at a high angle of attack and or flying in a sideslip or forward slip for up to 10 seconds at a time (if possible).
HCR	Clouds, light rain.	Standard L-pattern maneuvers@18~20kft, high altitude flights, clouds observation and light rain. Ground surface visible by radar is essential.
LAMS	Acquire TAS and 3D wind data to compare with the updated pitot static system.	Air maneuvers: rollercoaster, yaw, circle maneuvers. Wide altitude range, but must have adequate aerosol backscatter to obtain adequate velocity measurements. This may skew the sampling towards lower and middle atmosphere.
Los Gatos Picarro Aerolaser-CO	Sampling over a large range of altitudes and humidity. Additionally, we request pitch maneuvers at a few altitudes, including, if possible a set of maneuvers in the boundary layer. Finally, a level 10-minute boundary layer transect will allow us to quantify the extent of aircraft acceleration sensitivity.	Clear sky measurements over a range of air composition (spanning rural and near surface source emissions; e.g. energy harvesting, highways, urban centers, power plant, or wildfire). A large range of humidity is also requested; cloud sampling in target areas will not interfere meeting our measurement needs. Request pitch maneuvers.
MTHP	Test instrument operation on the GV, potential upgrade path for the HAIS MTP.	Flights under clouds would be beneficial, but not required.

OP-1	Test performance at variety of altitudes.	Multiple altitudes, preferable with level legs at each; no specific altitudes required.
PHIPS	Straight legs in clouds	No special requirements for altitude or airspeed
Pitot static	Test redesigned static pressure sensor line that will be part of standard infrastructure for future GV projects.	All conditions. May need enough aerosols to compare with LAMS.
POLAR	The goal of these flights is to test the topographic/bathymetric lidar's response to open water, snow/ice, and land scattering surfaces. To have clear returns from the ground, flights during clear weather conditions will be necessary. A strong desire for low solar background during dedicated flight lines would also be beneficial. Snow/ice/meltwater acquisitions, but it should be noted that this would be considered a bonus opportunity.	1) low flight altitudes (300-1,000ft AGL); 2) flight speeds at 185-275 kts., or below, to achieve our desired horizontal and vertical resolutions,over varying surfaces, including water-to-shore transitions, rivers, lakes or ocean; 3) limit cruising pitch during flight line to be below 5 degrees over land, and as low as possible over open water.
VCSEL-1 and VCSEL-2	Both in-cloud and clear-sky samples are necessary. In particular, in-cloud samples for ice, mixed-phase and liquid clouds are needed for assessing the derived relative humidity values based on the water vapor and temperature measurements.	The optimal attitudinal range is from surface to 14.5 km (flight ceiling of GV). Both clear air and in-cloud sampling is desired. Penetrations of mixed phase, ice and water clouds are desired.