

Flight Patterns for WINTRE-MIX

3 Regions of flight:

- A. Northeast of Montreal – mostly oriented SW – NE, along the St. Lawrence Valley
- B. East-SouthEast of Montreal – mostly oriented N-S, mostly on the Canadian side of the border
- C. Southeast of Montreal – mostly oriented N-S, mostly on the US side of the border, along the Champlain Valley

Generally, flight altitudes will be constrained to between about 15 kft to as low as possible/practical.

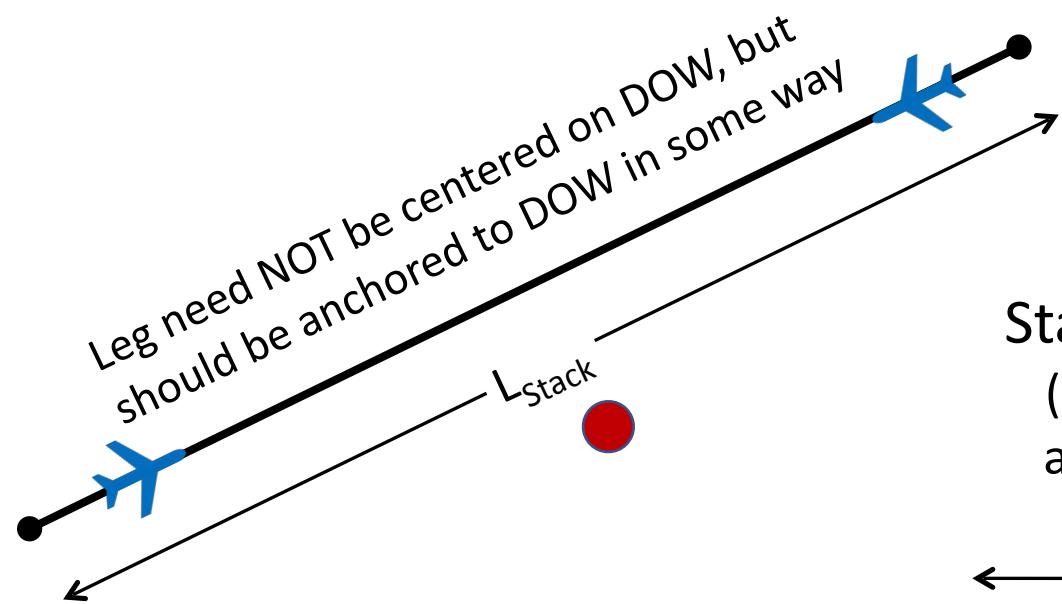
Flights will occur in clouds and precipitation, and expected to be IMC conditions throughout much of the flight

Typical flight will plan for ~3 hours on station time (less early in project, maybe more at end of project)

All flights will consist of some combination of the following:

- A. Straight and level legs, at the same altitude, ranging from 50 to 100 km in length—oriented along the valley (SW-NE in the St. Laurence; N-S in the Champlain)
- B. Repeated straight and level legs along the same track, with each successive leg at lower altitude. These legs generally confined to about 50 km in length, each successive leg 1-3 kft lower than the previous one
- C. Missed approach at nearby airport (Drummond (likely), Montreal (unlikely), Plattsburg, Burlington)
- D. One to Two cross-valley legs per flight, perpendicular to the main pattern, maintaining fixed altitude during leg

When we need to hold for traffic—preference is to (1) orbit if anticipated time is less than 5 min; (2) change altitude if we can go lower, but remain on same track; (3) take a vector off route if no other options



Stack Pattern: Vertical Documentation

(Focus: In Situ Microphysics Observations,
assume Stationarity during entire pattern)

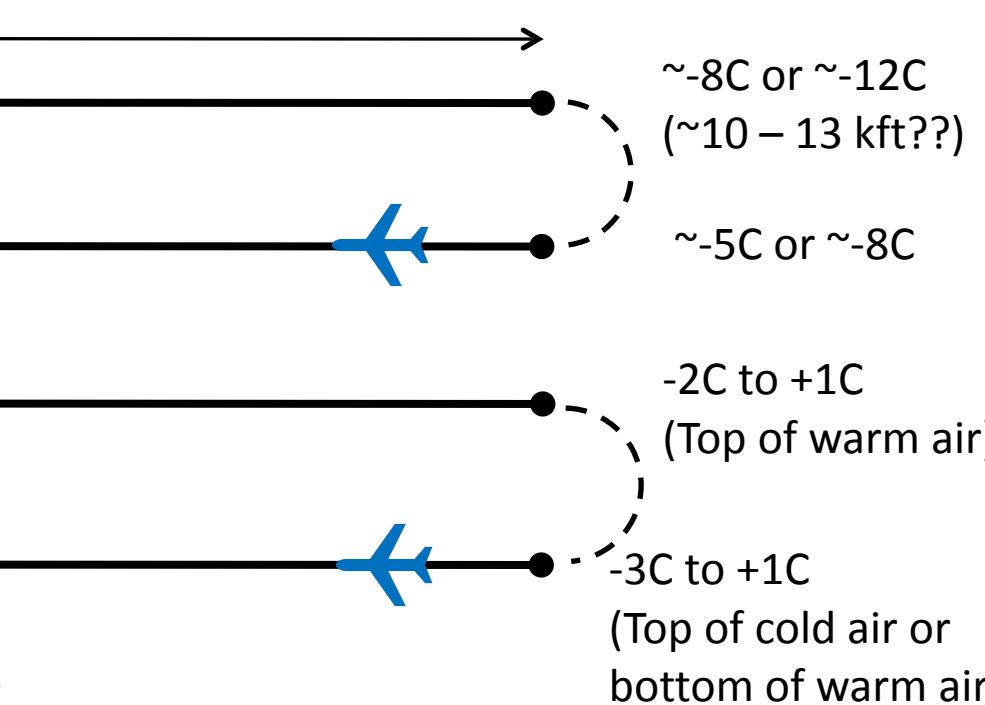
Leg Length/# Altitudes
depends on total time
to complete 'stack'

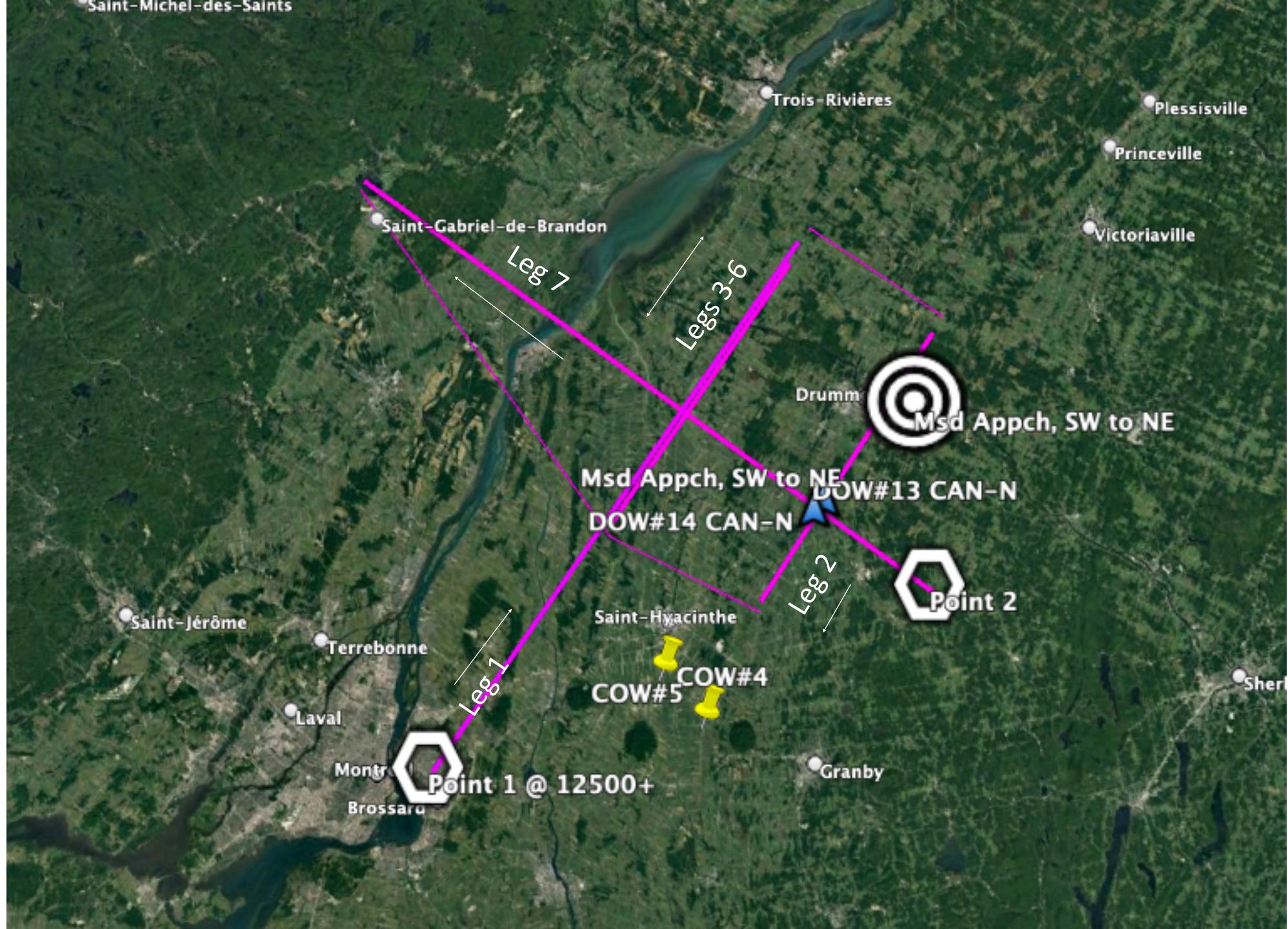
Spiral
Ascent

OR

Missed
Approach

Minimum Vectoring Altitude
(expect 3-4 kft MSL)





A 'typical' Flight scenario for Stacked Legs – NE of Montreal

Name of pattern

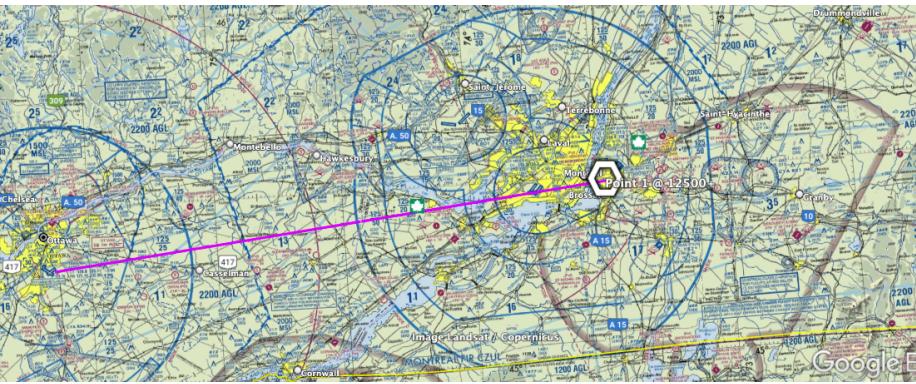
NE-STACK 1

1. (35 min) Ferry from Ottawa to Point 1 – refine leg altitudes during ferry
2. (16 min) Leg 1, surveillance, 100 km leg. (typically at 12-15 kft MSL, depending on T (~-10 to -12 C))
3. (5 min) Transition to Leg 2 (25 km) same alt
4. (9 min) Leg 2 (50 km) NE to SW, same alt, pass over DOW
5. (5 min) Transition to Stack (25 km) descend to top of stack altitude
6. (43 min) Legs 3, 4, 5, 6 (50 km) stack, each leg lower alt, last MinAlt
7. (~20 min) Missed Approach, Drummondville SW to NE
8. (15? min) Climb to Ascent to 12 - 15 kft, transit to Point 2
9. (16 min) Leg 7 Cross Valley (100 km) at 10000 to 12500+
10. (35 min) Return Ferry

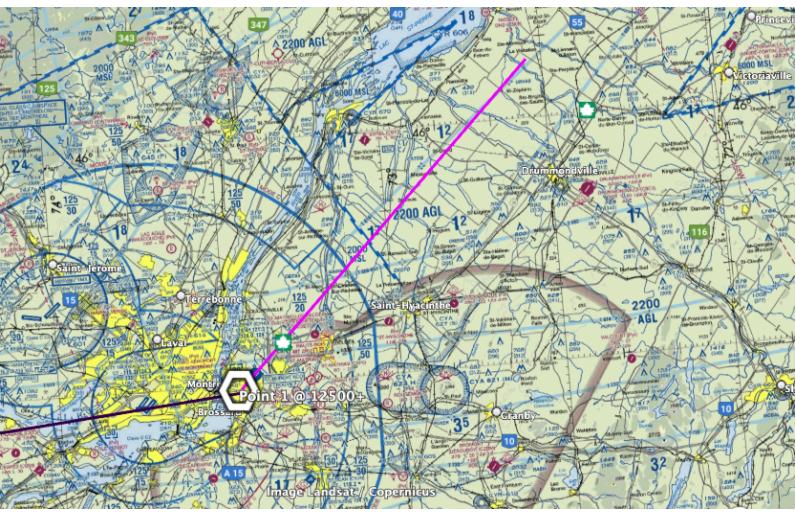
TOTAL time ~200 minutes (3.3 hours)

If time remains, may add another set of stack leg (#6) or another surveillance leg (#2)

#1 – Ferry from Ottawa to Point 1



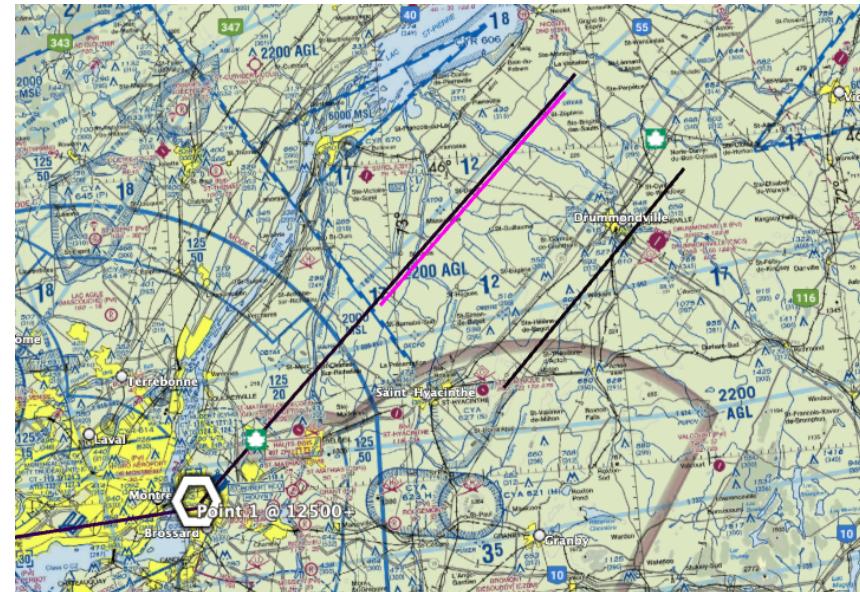
#2 – Surveillance Leg (~100 km), fixed alt, 12-15 kft, SE → NNW



#4 Leg 2, NE to SW, 50 km, fixed altitude



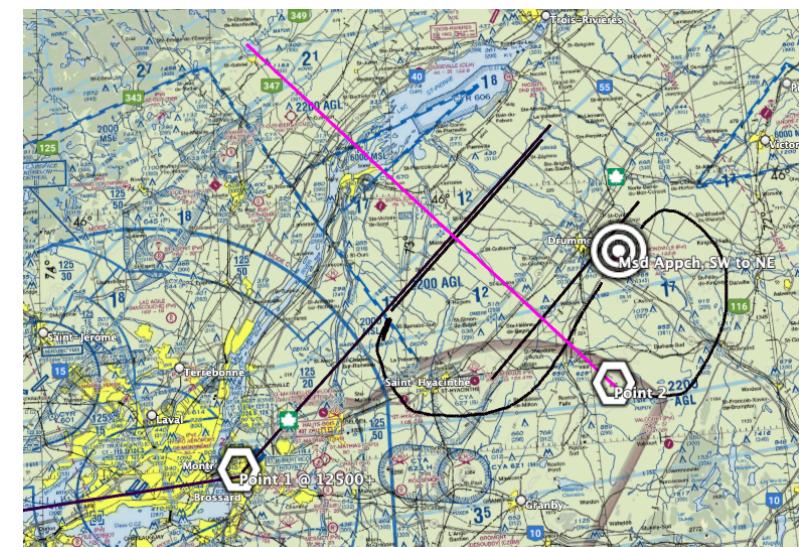
#6 Four repeated Legs, stepping down in alt. for each leg. Begin at ~10 kft, end at lowest possible



#7 & # 8 Setup and conduct Missed appch at Drommondsville, transit to point 2



#9 Cross-valley leg SE to NW, 100 km





SE-Stack1

(35 min) Ferry from Ottawa to Point 1
(20 min) Leg 1, surveillance, 125 km leg. (typically at 12-15 kft MSL, depending on T (~-10 to -12 C))
(5 min) Transition to Leg 2 (25 km) same alt
(9 min) Leg 2 (50 km) S to N, same alt, pass over DOW
(5 min) Transition to Stack (25 km) descend to top of stack altitude
(43 min) Legs 3, 4, 5, 6 (50 km) stack, each leg lower alt, last MinAlt
(~20 min) Missed Approach, Plattsburg
(15? min) Climb to Ascent to 12 - 15 kft, transit to Point 2
(12 min) Leg 7 Cross Valley (75 km) at 10000 to 12500+
(35 min) Ferry return to Ottawa

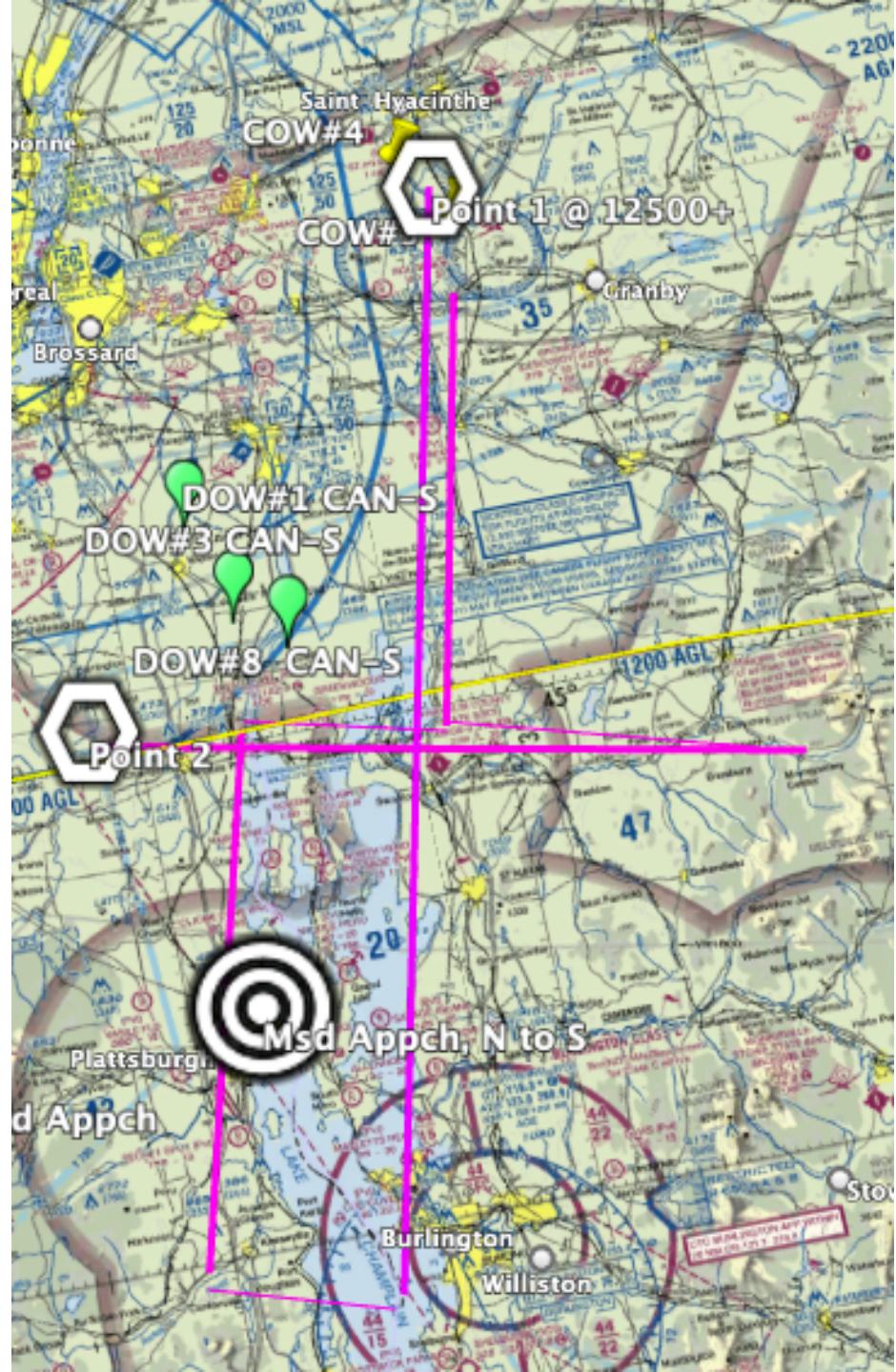
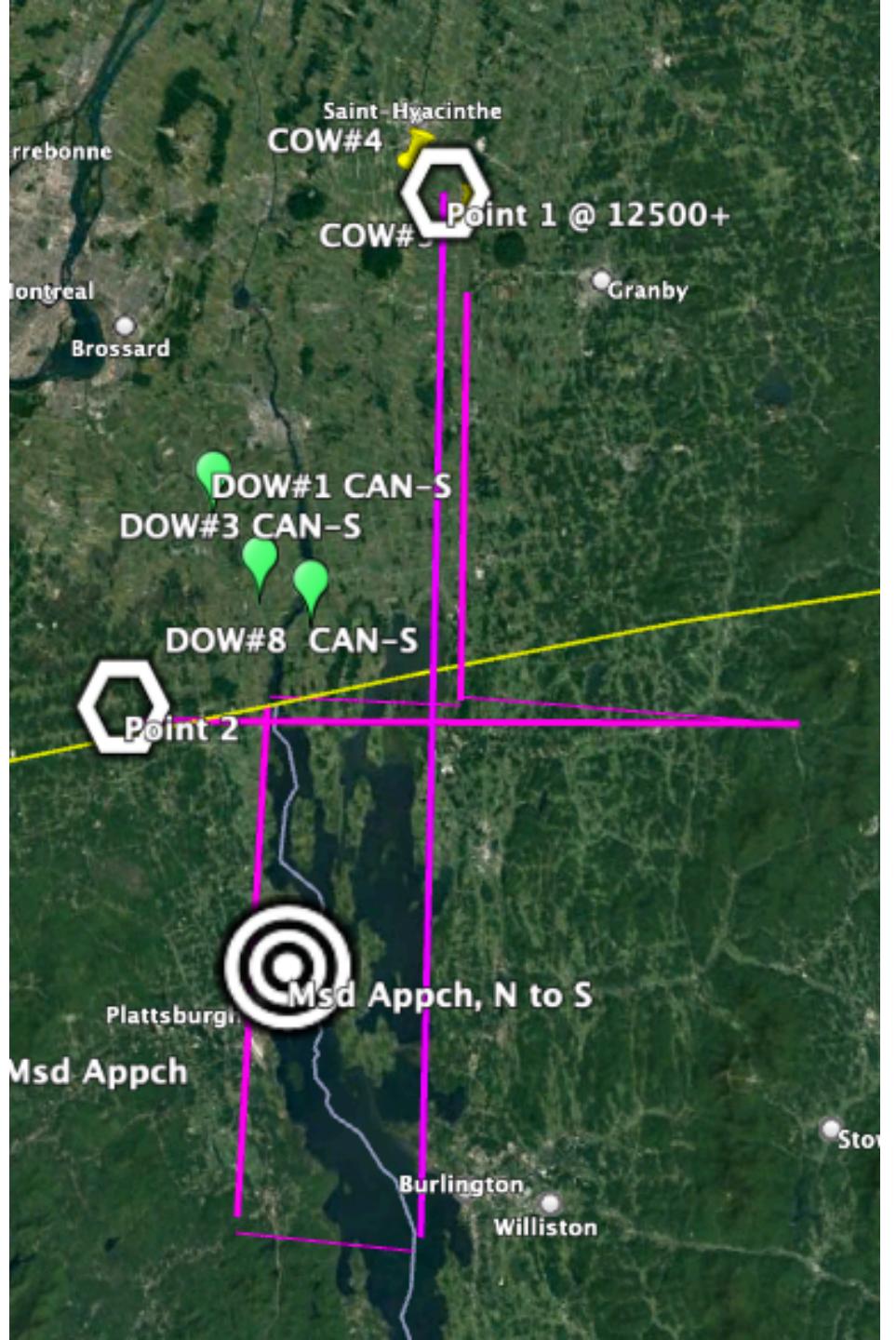
and **SE-Stack2**

Similar to SE Stack 1, but occurs a bit further south and mostly in US airspace.

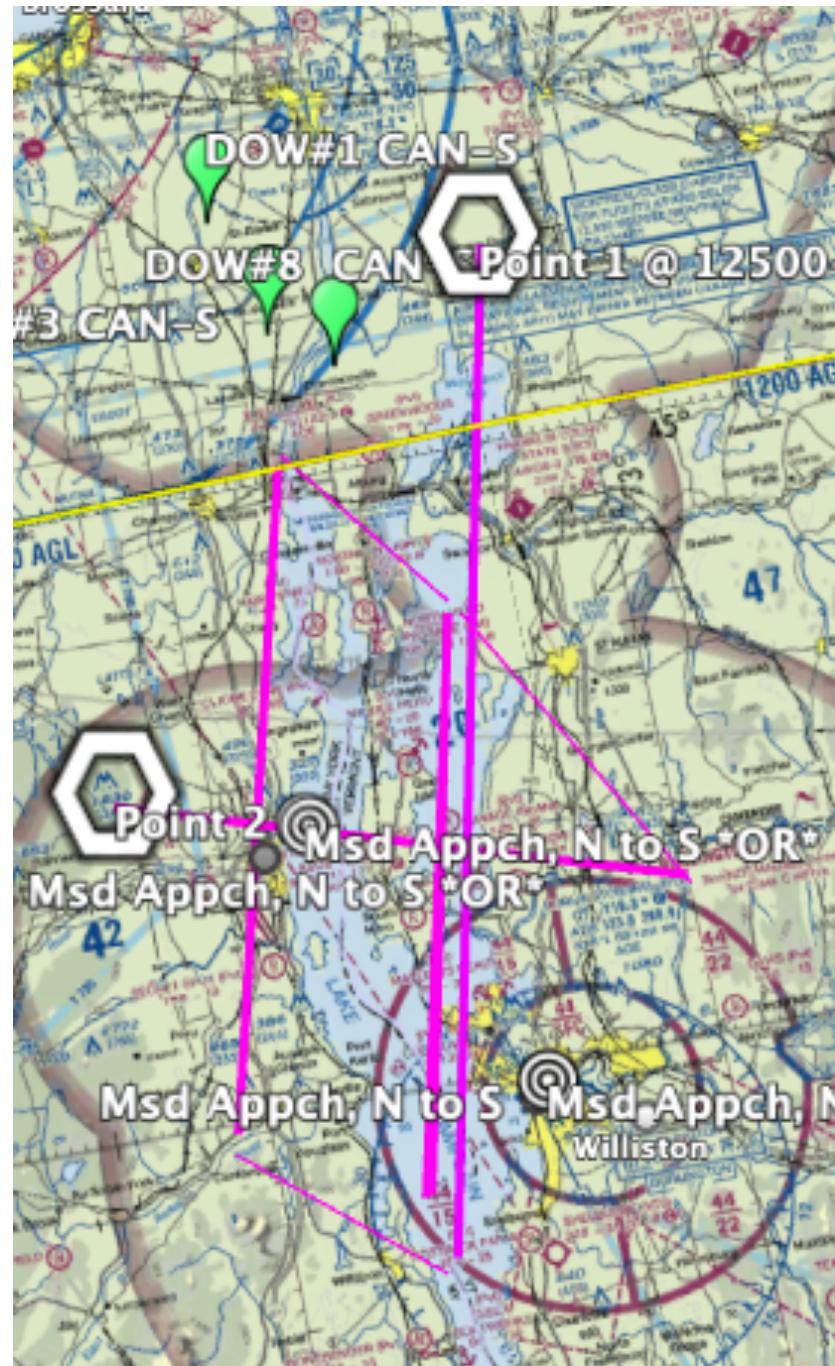
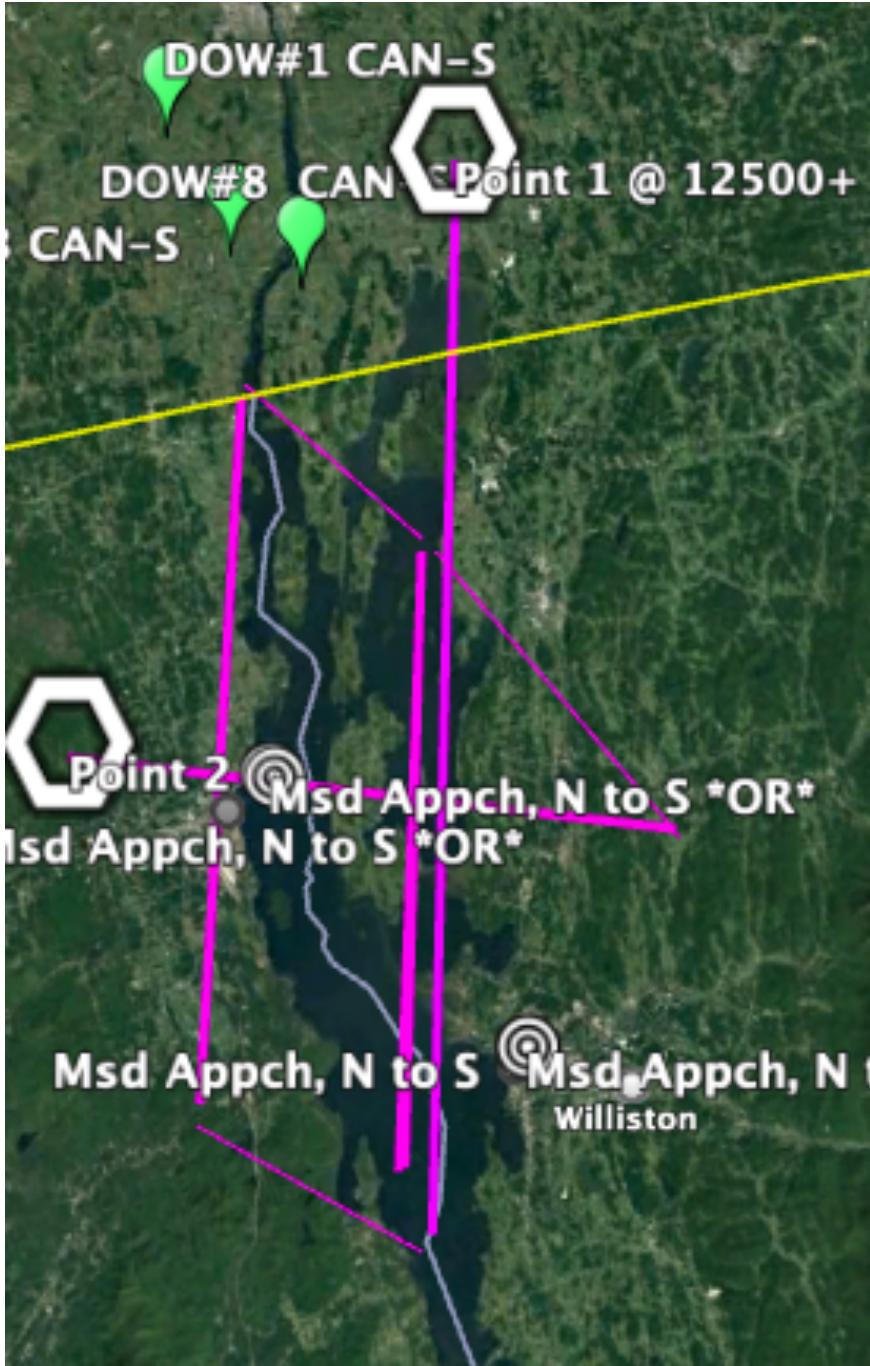
TOTAL time 200 minutes (3.3 hours)

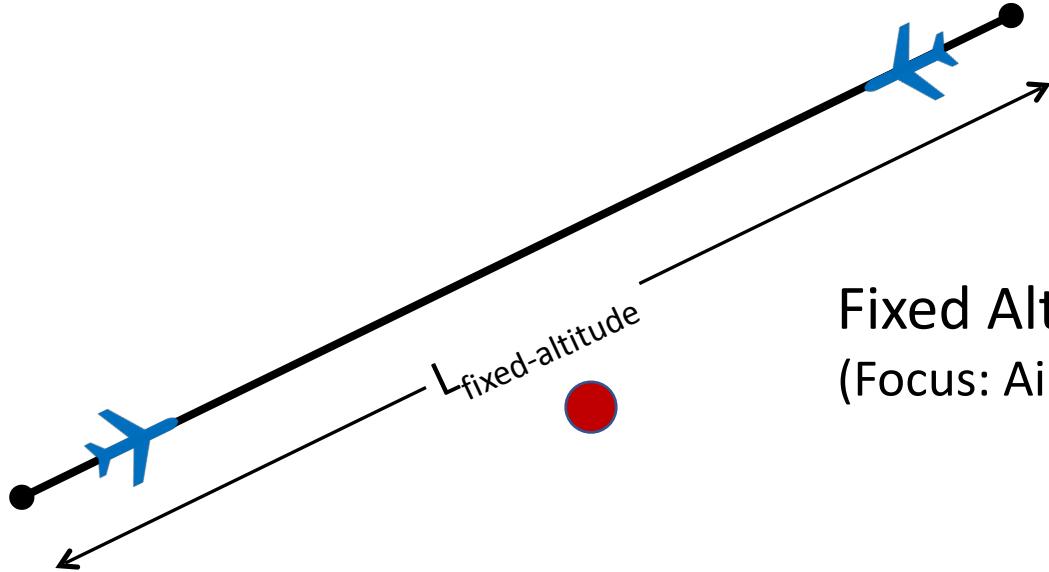
Entire pattern shown on next slides

SE-Stack1

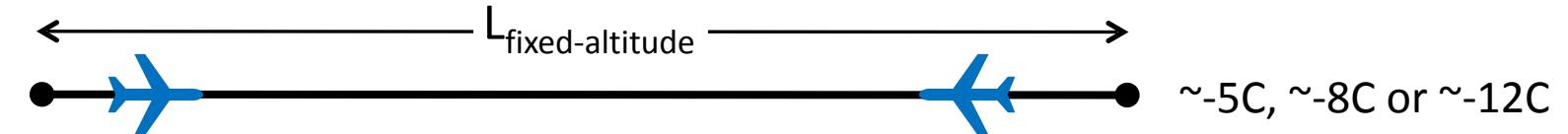


SE-Stack2





$$L_{\text{fixed-Alt}} > L_{\text{Stack}}$$



Leg need NOT be centered on DOW, but should be anchored to DOW in some way



Fixed Altitude Pattern: Temporal Documentation
 (Focus: Airborne Radar Observations, evolution of system,
 Longer legs flown at a single level)

3-5 repeated legs depending on
 leg length/time to repeat leg

For Rapidly-evolving/changing systems—key questions:

1. How long to make legs?

for 100 km legs – can execute ~10 legs during 3 hour on station time

2. At what altitude?

Can operate up/down radar or dual-down (DD) – do we focus on capturing DD and stay at top (or above) cloud, or operate up/down and capture microphysics in clouds?

Alternatively—can operate at two altitudes – outbound at high (lower) and inbound at low (higher)