

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.

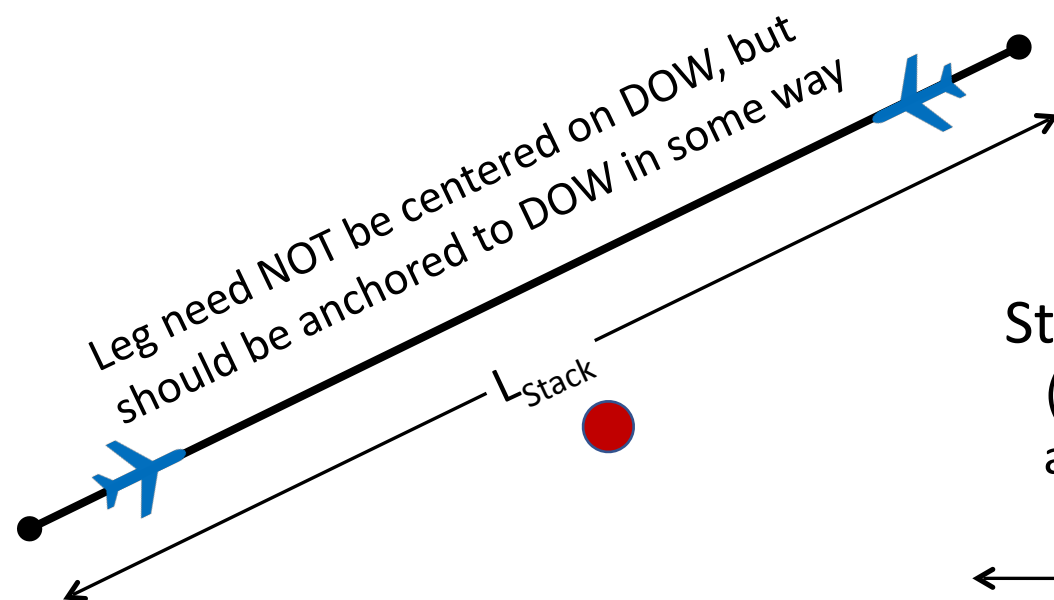
Flights will occur in clouds and precipitation, and expected to be IMC conditions throughout much of the flight

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. Lawrence; 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)

L_{stack}

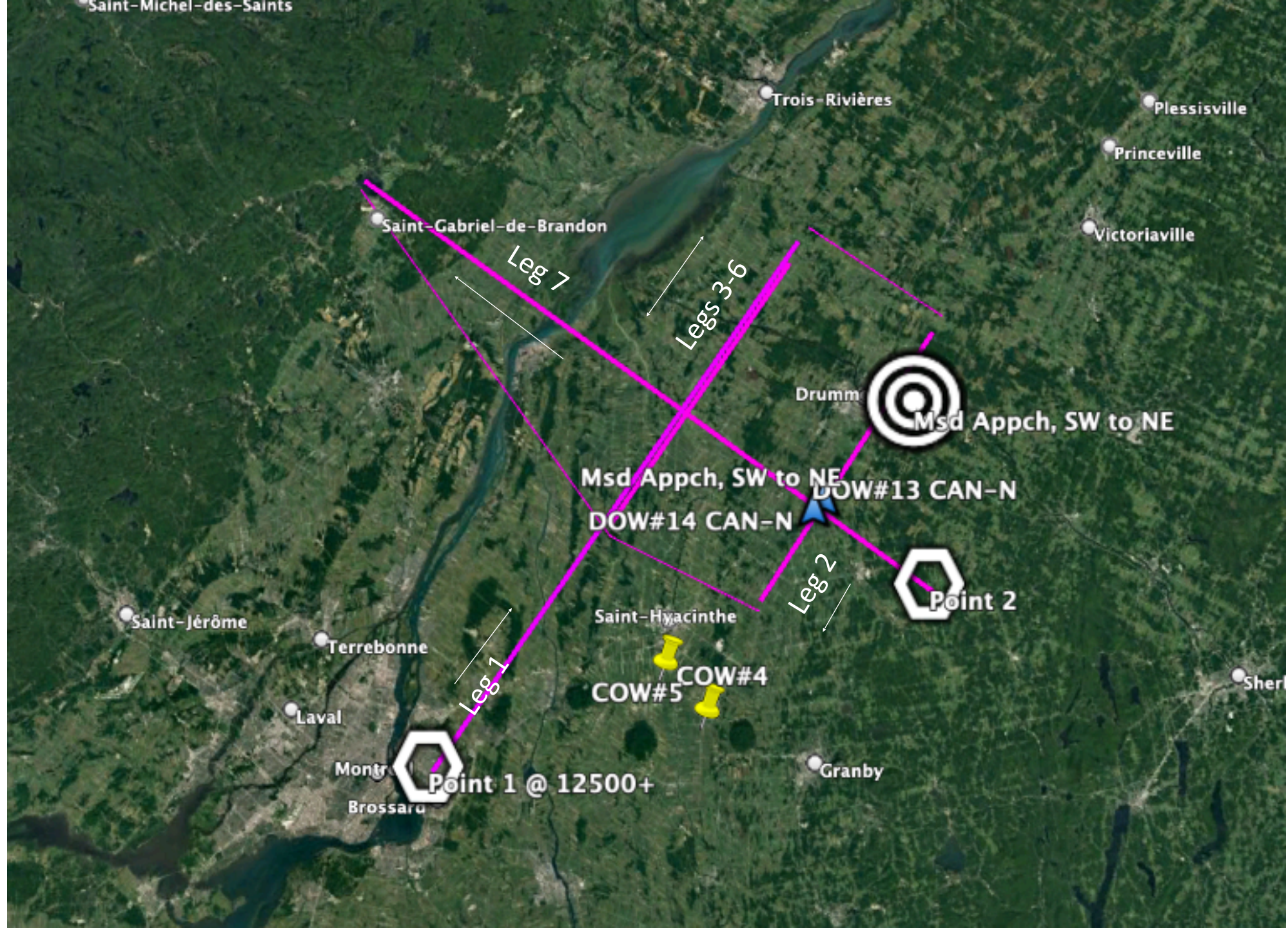
~ -8C or ~ -12C
(~10 – 13 kft??)

~ -5C or ~ -8C

-2C to +1C
(Top of warm air)

-3C to +1C
(Top of cold air or bottom of warm air)





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

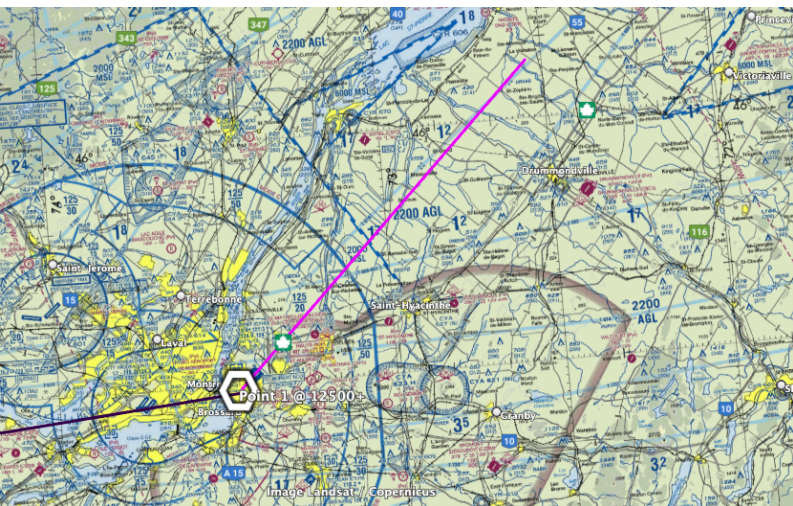
TOTAL time ~200 minutes (3.3 hours)

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



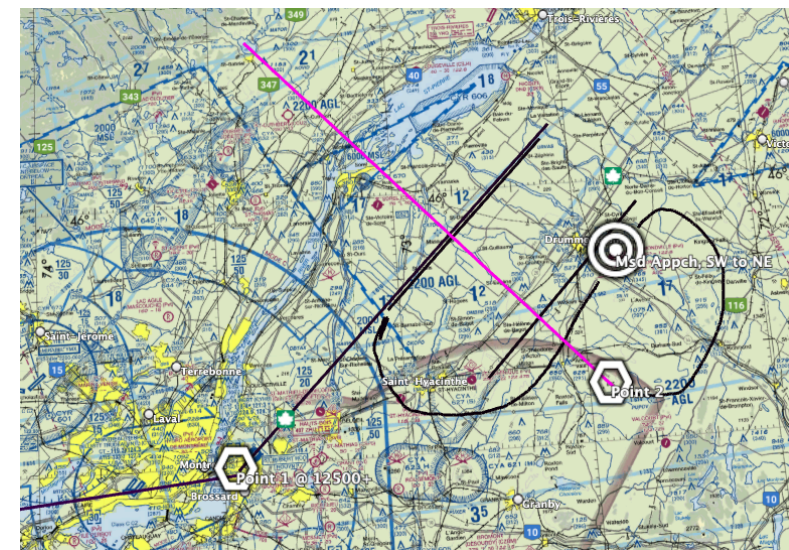
#7 & #8 Setup and conduct Missed appch at Drommondville, transit to point 2

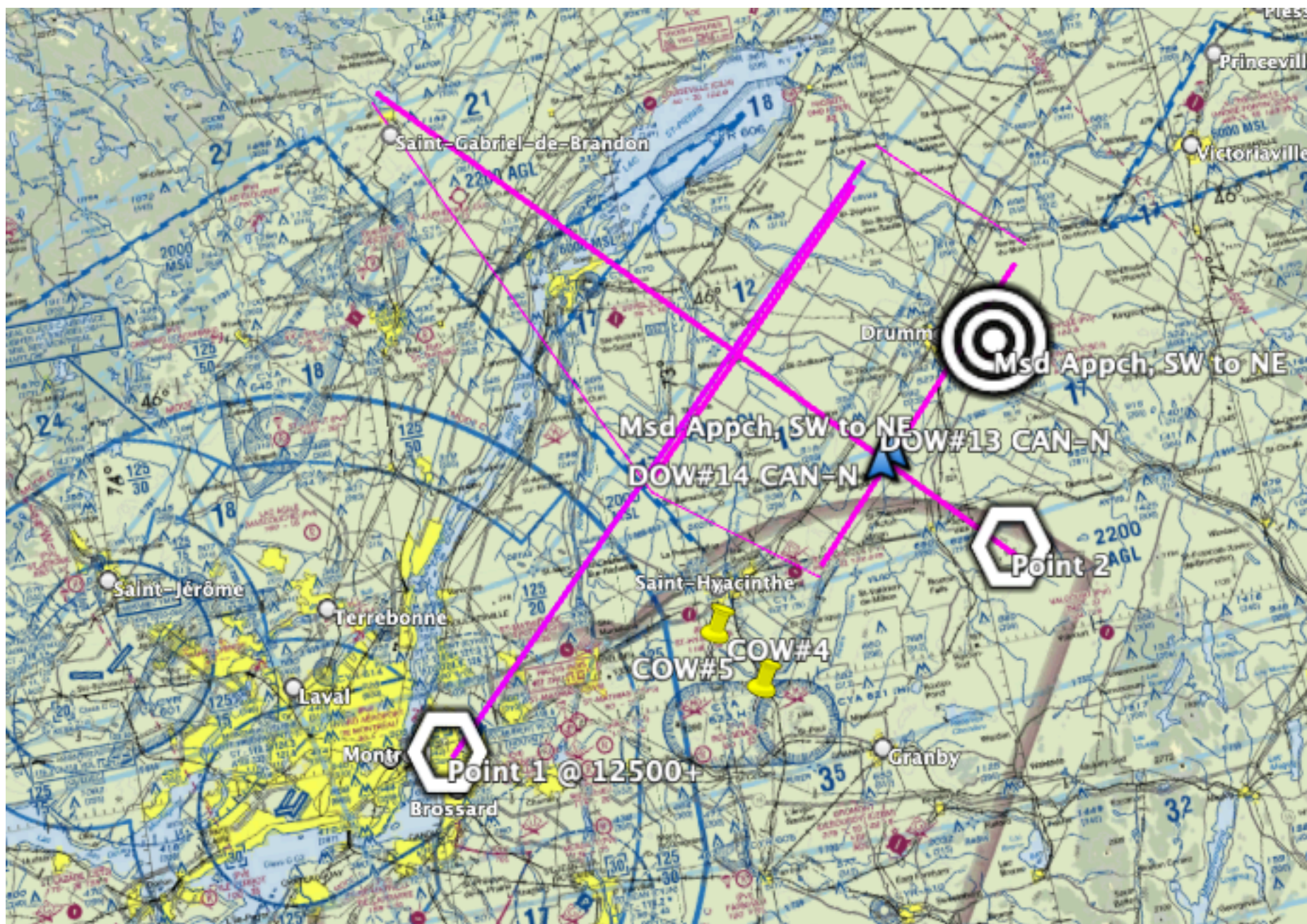


#6 Four repeated Legs, stepping down in alt. for each leg. Begin at ~10 kft, end at lowest possible



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





Similar Patterns setup SE of Montreal

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

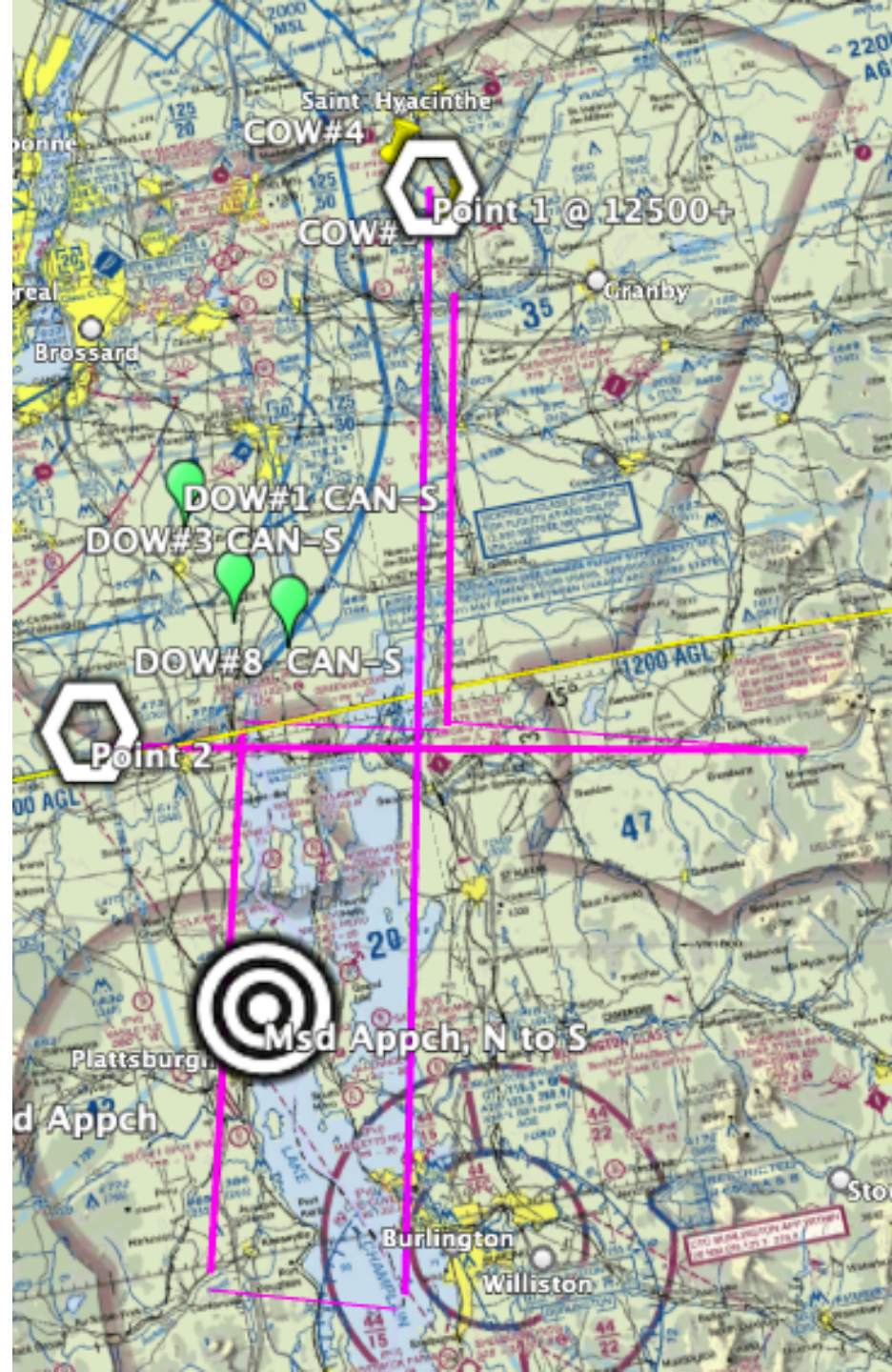
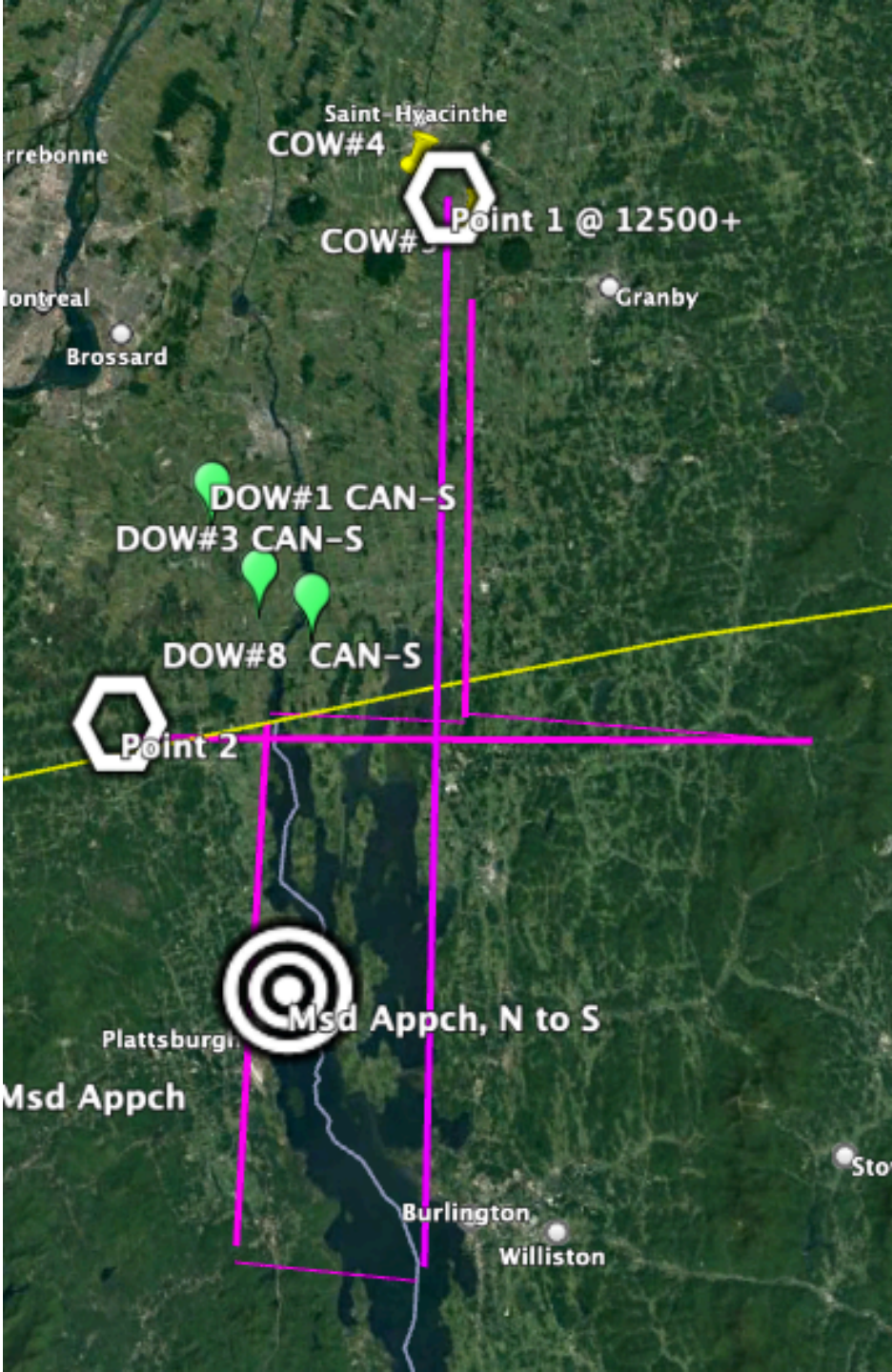
TOTAL time 200 minutes (3.3 hours)

and **SE-Stack2**

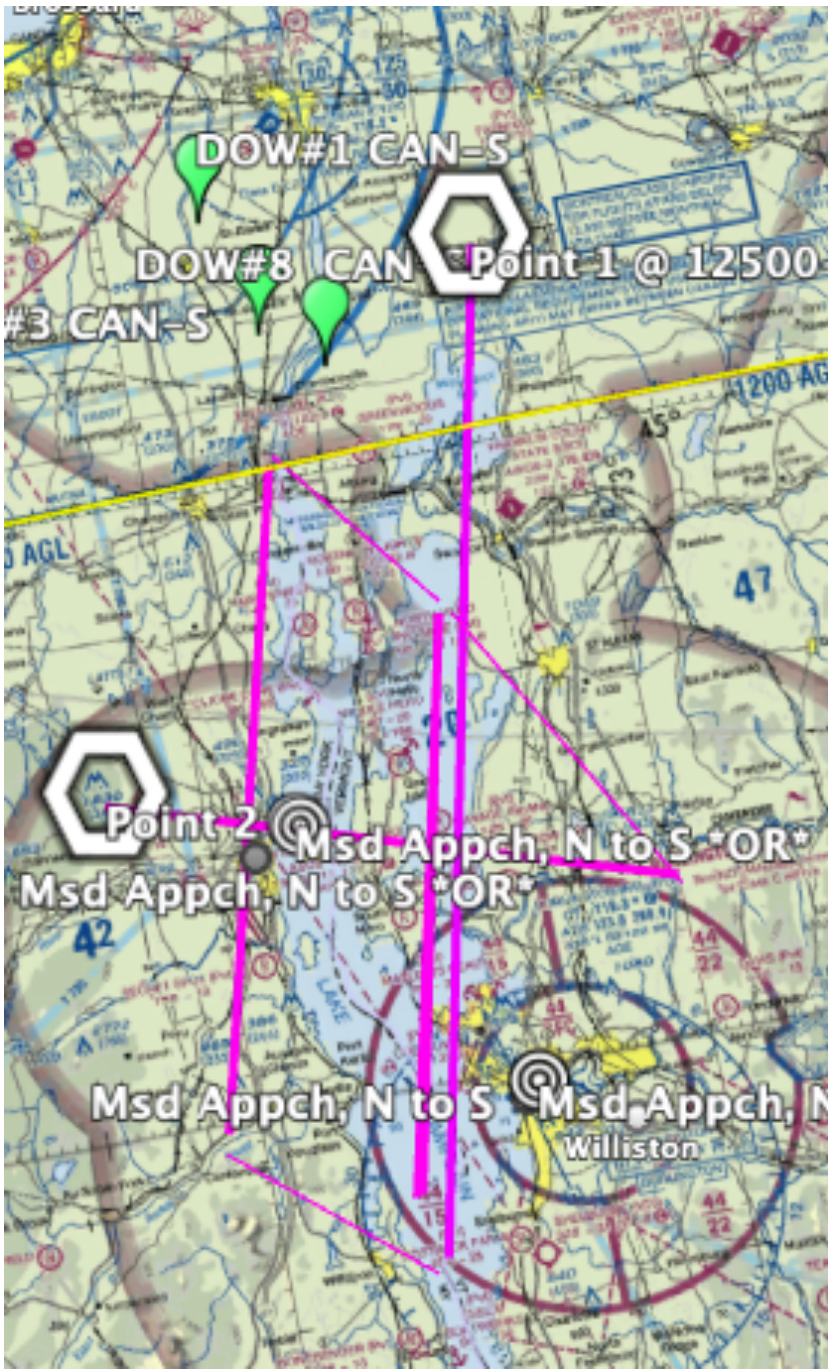
Similar to SE Stack 1, but occurs a bit
Further south and mostly in US airspace.

Entire pattern shown on next slides

SE-Stack1



SE-Stack2

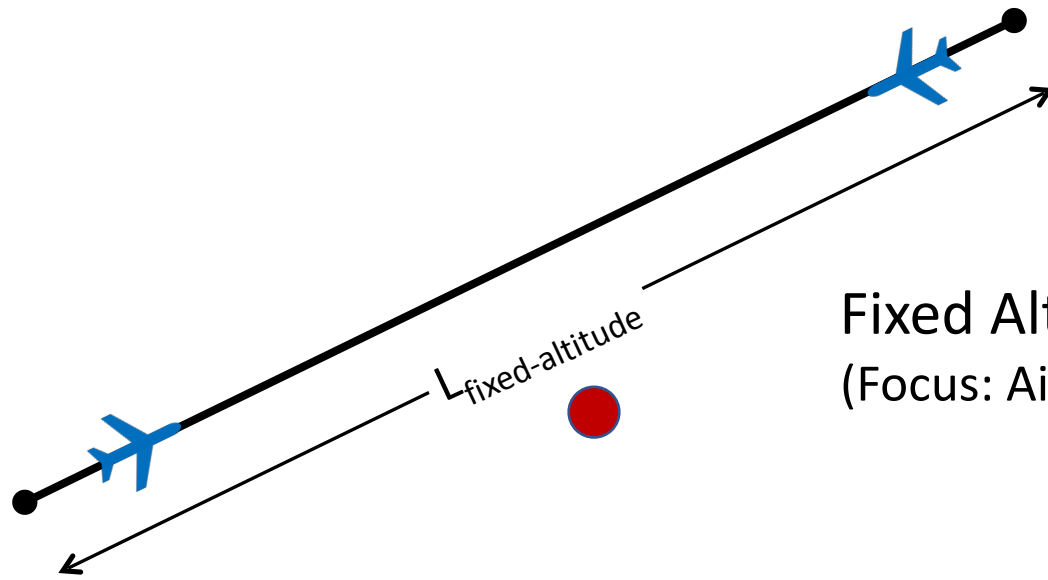




Convair

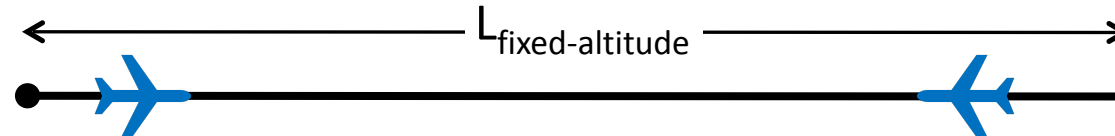


DOW



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



~-5C, ~-8C or ~-12C

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

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

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)