Pressure Pattern Navigation

Ed Williams

SMXGIG 2001

The shortest route may not be a straight line when you cross a weather system.

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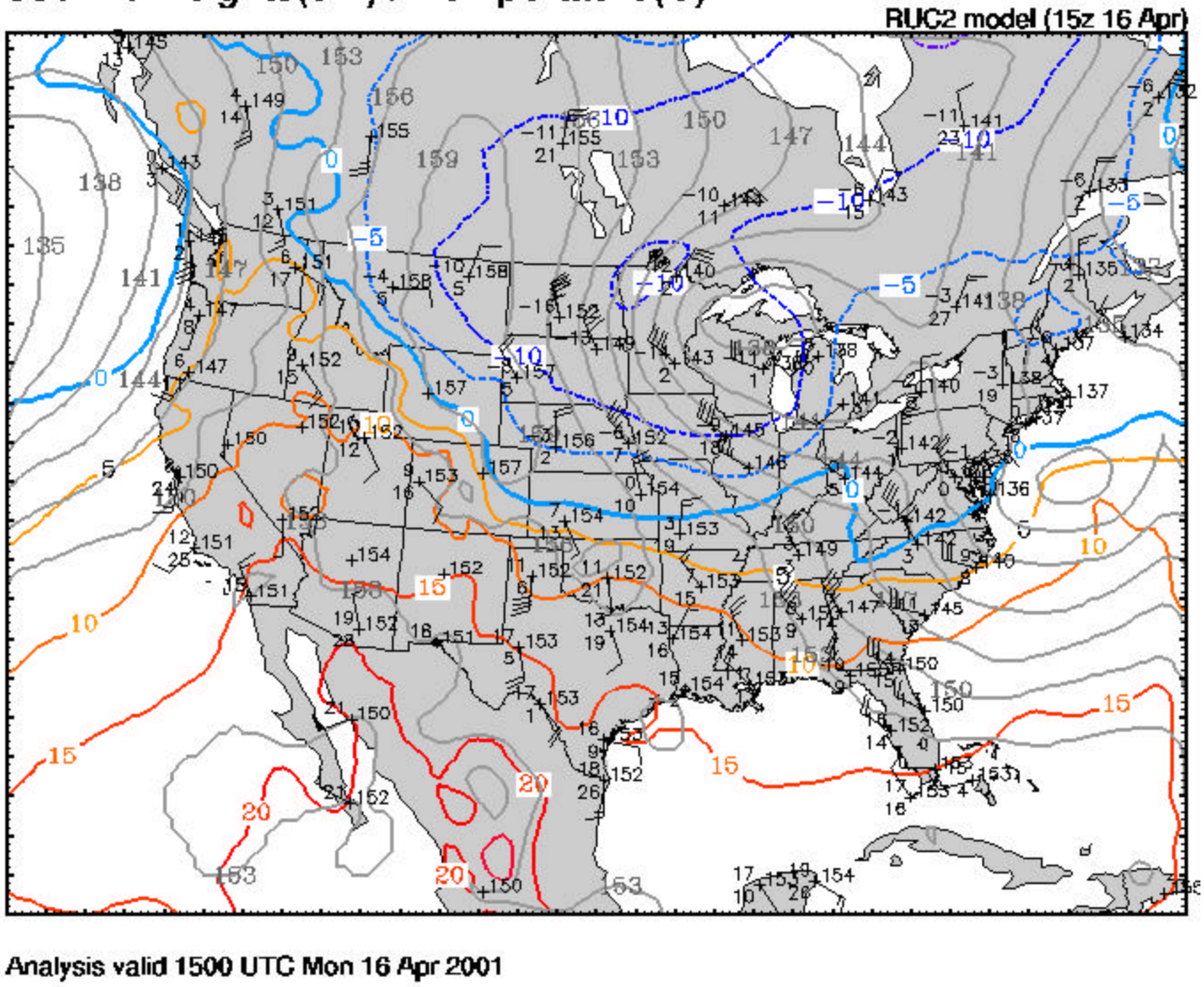

Flying South of the straight line gets better winds

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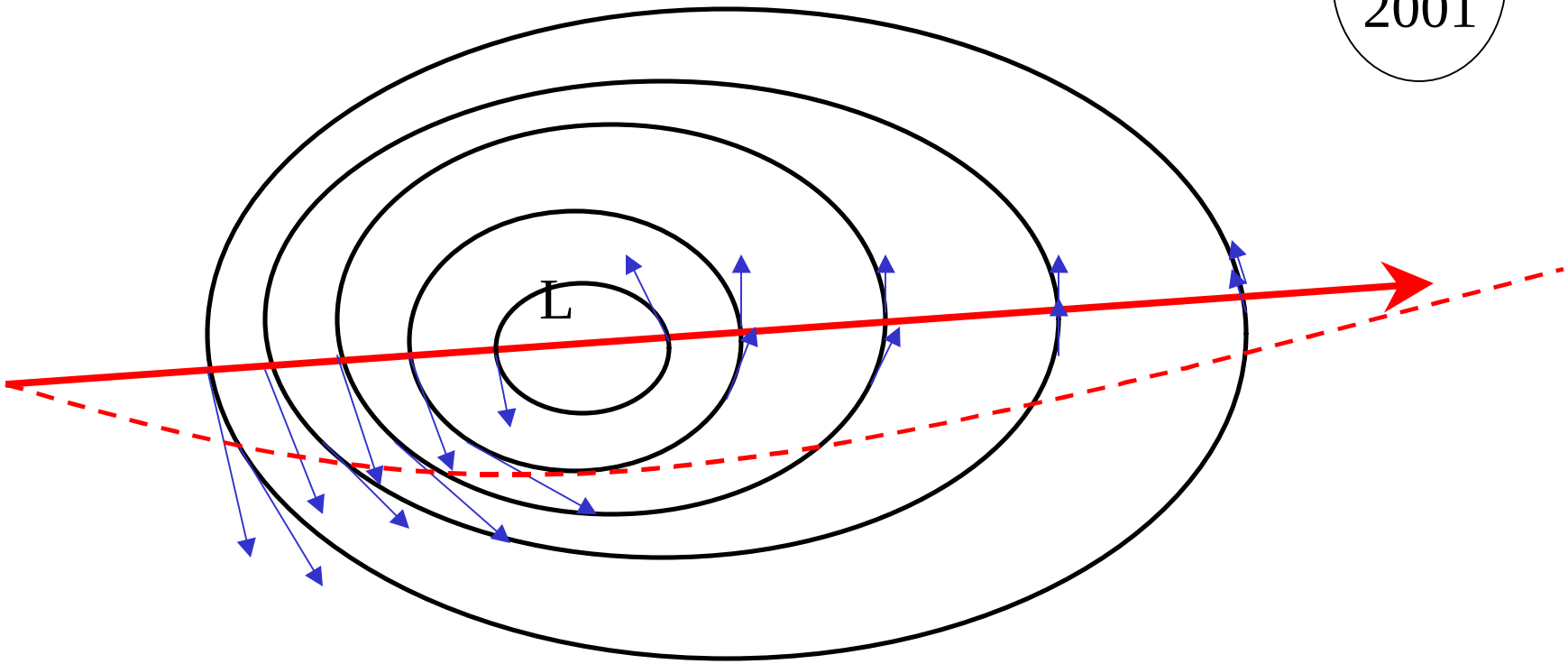

Fly a constant heading, rather than crabbing left then right.

Cross-wind component - inversely as the distance between isobars

Drift proportional to pressure change!

Fly between points of equal pressure - drift cancels!
Drift inverse with the groundspeed.

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Bellamy's formula...

Drift (nm) = 21500 * (p2 -p1) /(sin(latitude) * GS)

p2 > p1 => drift to left and vice versa

GS is the average groundspeed (knots)

p2-p1 is the difference in pressure
between the destination and departure

21500 (altimeter setting - in Hg)
21500 => 635 (sea level pressure - mB/hPa)
21500 => 708 (isobaric height - dm)

Knowing your groundspeed and the pressure along your route you can plot the offset of the minimum crab path.

Get the isobaric heights of an upper air chart.

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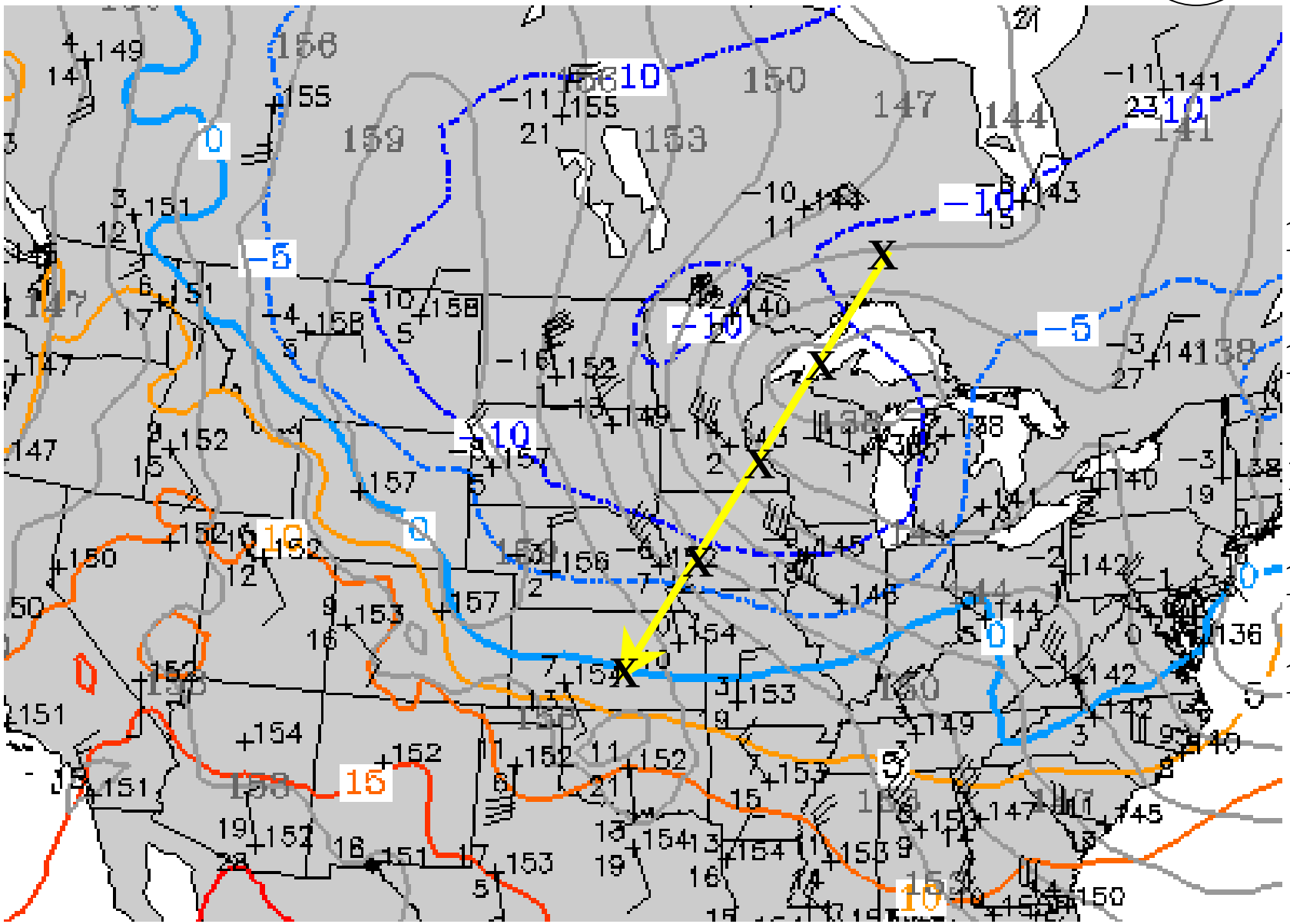

Compute the crosswind drifts.

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Average groundspeed 150 kts
Average latitude ~ 42 degrees
Drift = 708/(150*sin(42 deg)) = 7nm /dm

Position:	Origin	25%	50%	75%	100%
Height:	144	137	141	150	157
Drift:	0	-49	-21	42	91
Crab:	0	-23	-45	-68	-91
Waypoint:	0	-72	-66	-26	0

Plot the offset waypoints.

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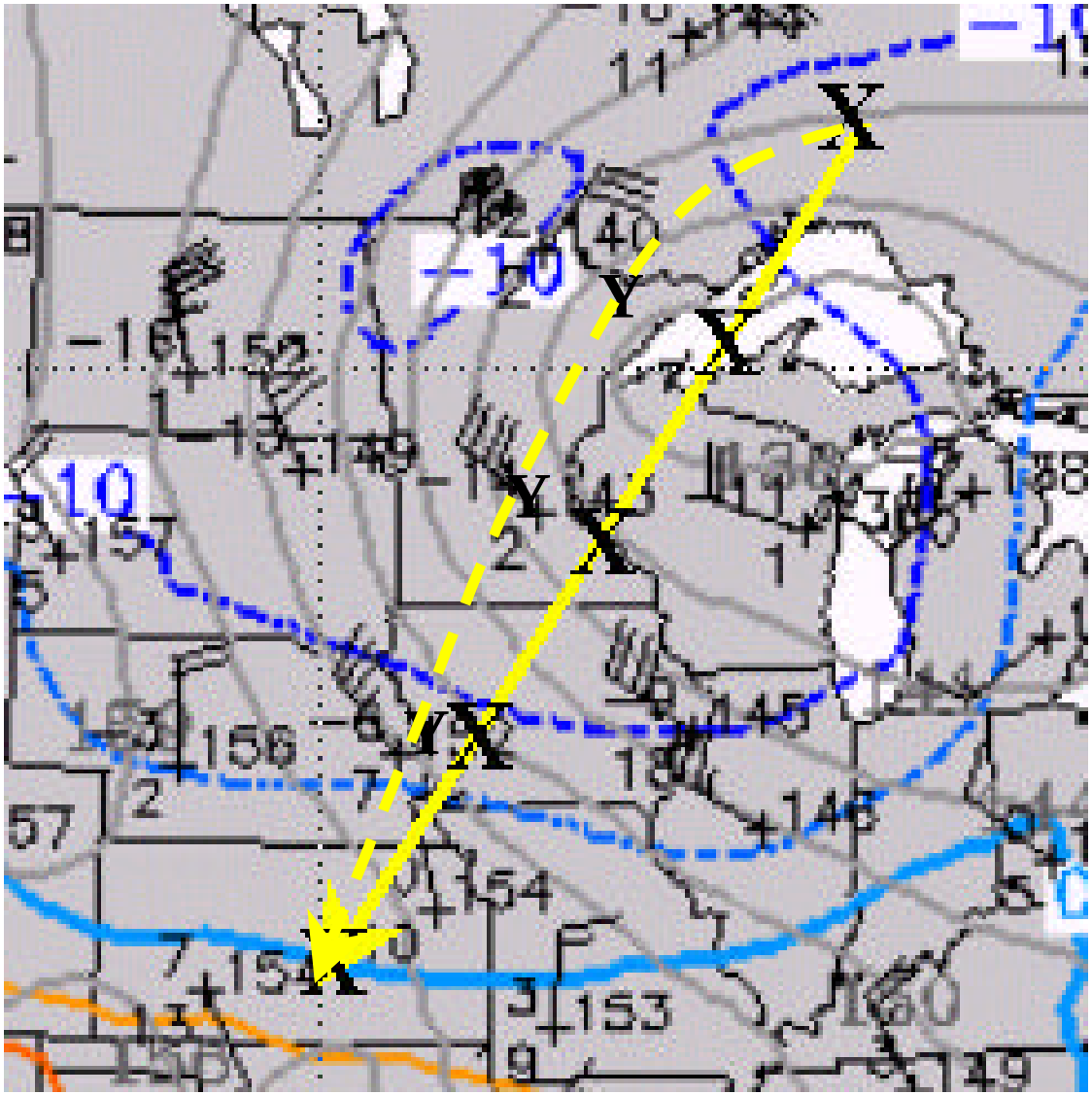

Path is downwind of straight line.

How to best use this technique

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Don’t bother on short trips (< 300nm)
Most beneficial when crossing a high or low.
Savings increase with stronger systems.
Best to use appropriate upper air chart
(850 mB =5000ft, 700mB =10000ft, 500mB = 18000ft)

Calculate a few offset waypoints, then lay out your VFR/IFR route in reference to them. Remember there is more to planning a route than finding the shortest one!