



Preliminary Altitude and Fuel Analysis for KATL CDA.

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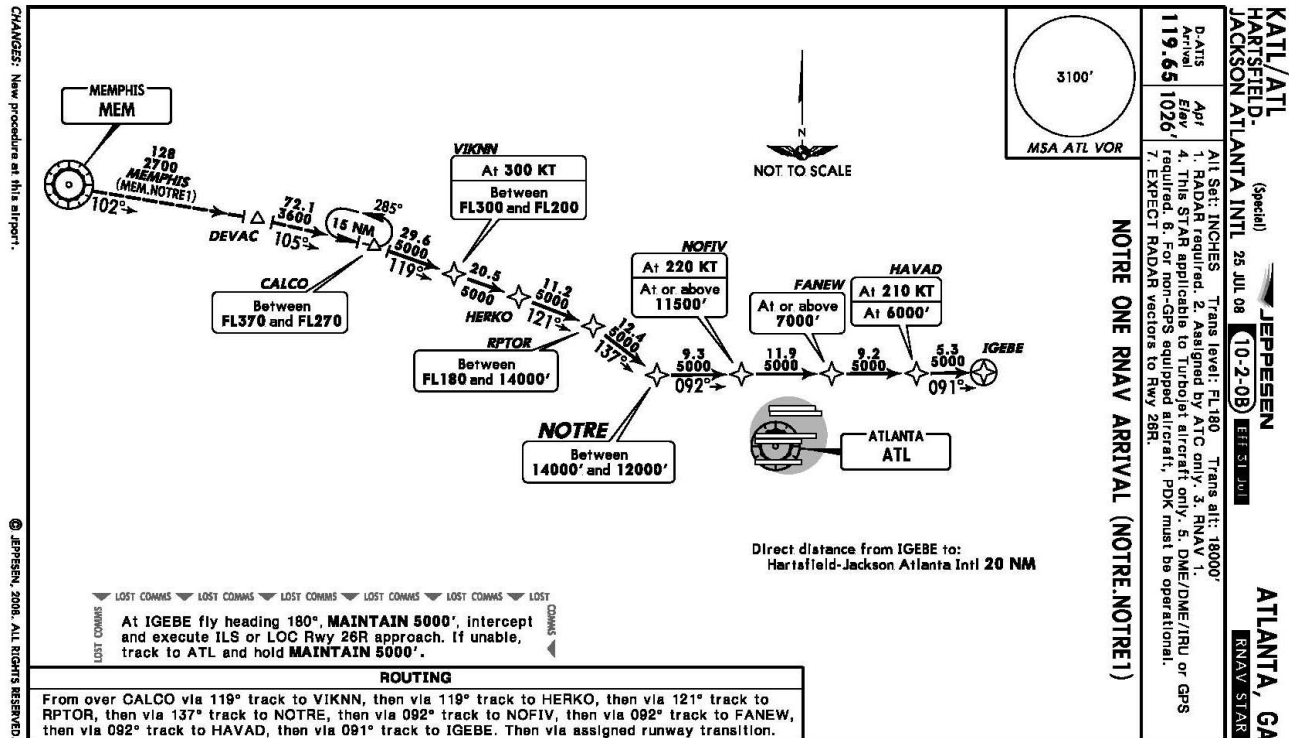
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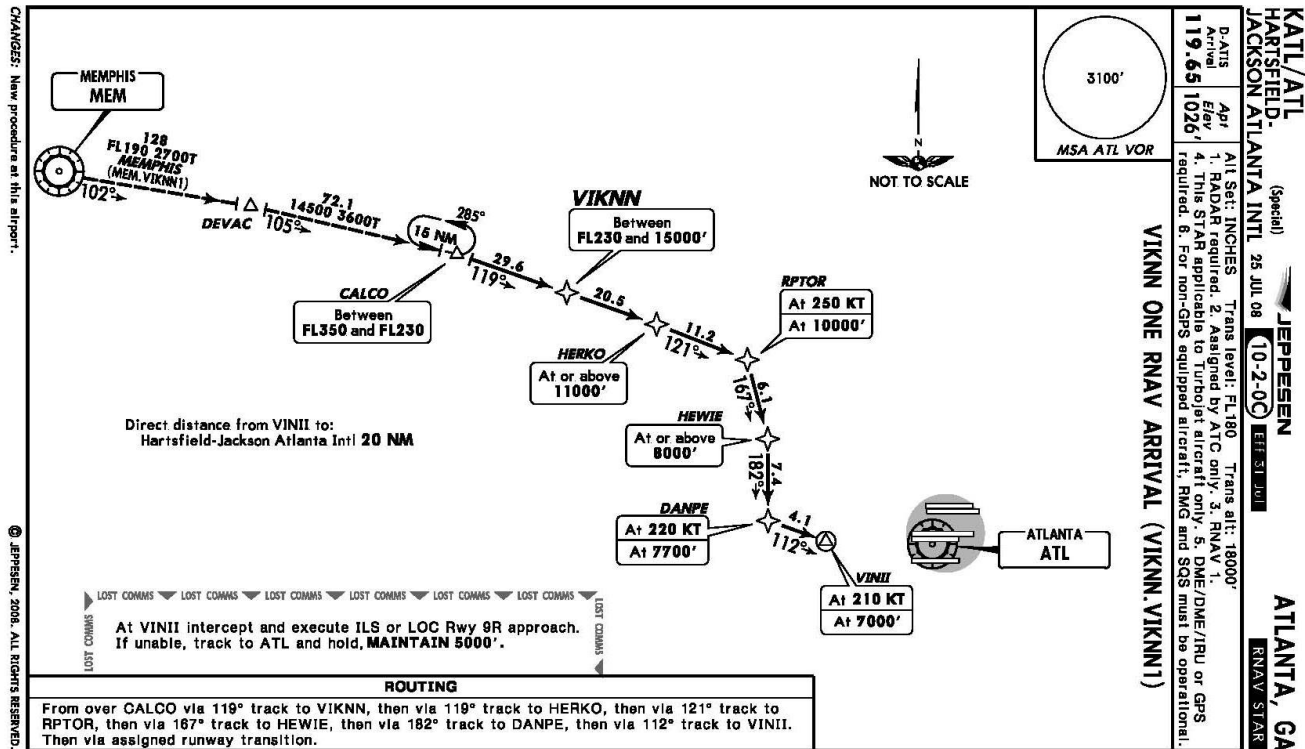
Atlanta flight test overview.

- ❖ Duration – August 19th, 2008 to November 18th, 2008.
- ❖ Time period for arrival flights – 0400 to 0615 EST.
- ❖ Airlines involved – Delta, AirTran and FedEx.
- ❖ Pilots provided with information package, and for Delta, a flight test advisory page in their Jeppesen handbooks.
- ❖ Other entities involved: Memphis Center (ZME), Atlanta Center (ZTL), Atlanta TRACON, Delta Operations Control Centre (OCC), Georgia Tech students.
- ❖ Aircraft types involved: A300F/A310F, B737-700, B737-800, B757-200, B767-300, B767-400, and MD10.
- ❖ Flights from Seattle, Portland, Salt Lake City, Denver, San Francisco, Las Vegas, Los Angeles, Orange County, San Diego, Honolulu, Phoenix and Memphis involved in test.
- ❖ Memphis Center were initially ensuring 15 miles in trail separation between aircraft; reduced to 10 miles on September 15th .

Atlanta - NOTRE Chart



Atlanta - VIKNN Chart



Some numbers.

- ❖ As of November 10th, 2008
- ❖ Days VIKNN arrival flown = 51
- ❖ Days NOTRE arrival flown = 23
- ❖ No Data for 8 days – bad data, or not asked for due to recording issues.
- ❖ A thorough analysis has been completed for the flights which have flown the VIKNN arrival (numbers as of November 3rd, 2008):

Airline and Aircraft	Count
AirTran Airways B737-700	88
Delta Air Lines B737-700	11
Delta Air Lines B737-800	21
Delta Air Lines B757-200	124
Delta Air Lines B767-300	84
Delta Air Lines B767-400ER	24
FedEx A300F/A310F	27
FedEx MD10	28

Airline	Total Flights Flown
AirTran Airways	86
Delta Air Lines	264
FedEx	55

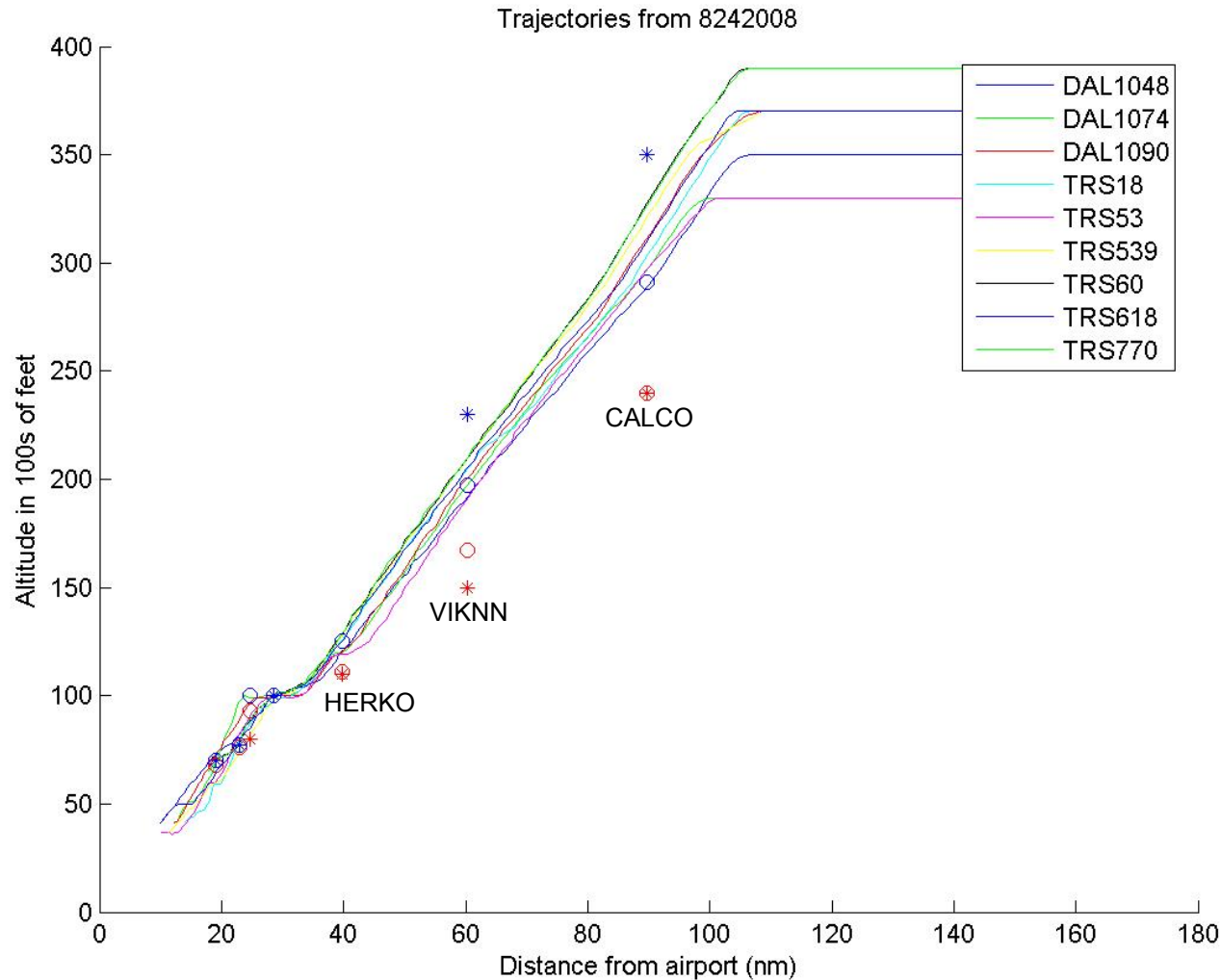
Data Extraction Method

- ❖ Data obtained from ZME for ZME, ZTL and TRACON airspace.
- ❖ Received in tabbed Excel files containing flight ID, altitude, ground-speed, lat/long, aircraft type, time and other parameters.
- ❖ CSV file was made for each day with the appropriate parameters.
- ❖ MATLAB was used to parse through the data.
- ❖ Scripts determine unique flights for each day and keep track of their lat/long, time, altitude, speed and aircraft type information.
- ❖ Altitudes and ground speeds at different waypoints are determined.
- ❖ Trajectories of flight for each day are plotted.
- ❖ Trajectories for each aircraft type are plotted on the same plot.
- ❖ Distance used on x-axis for each plot is straight line distance from ATL VOR.

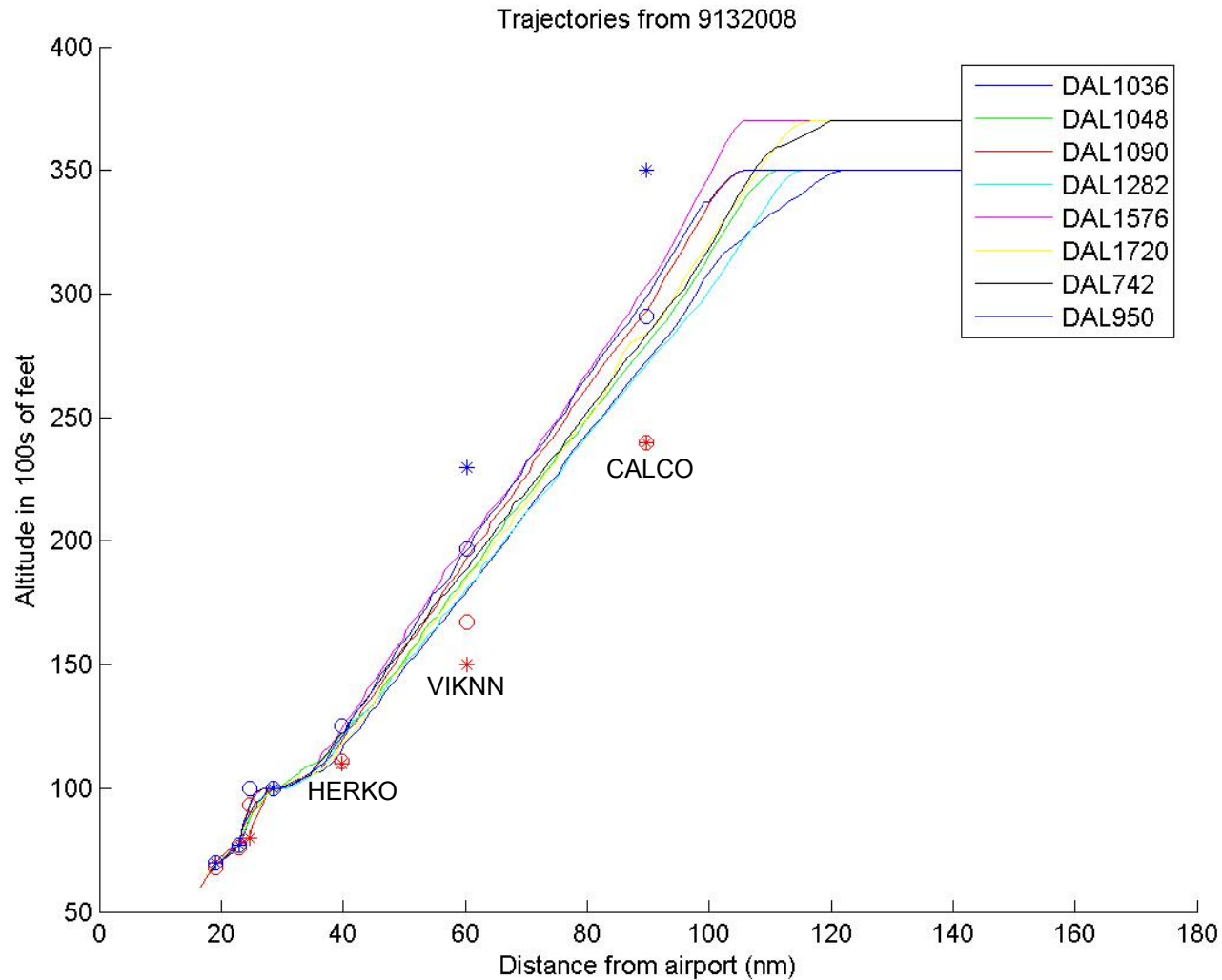
Key for plots.

- ❖ **Asterisks/Stars = Restrictions on plates.**
- ❖ **Circles = GT predicted bounds.**
- ❖ **Red = Lower Bound.**
- ❖ **Blue = Upper Bound.**

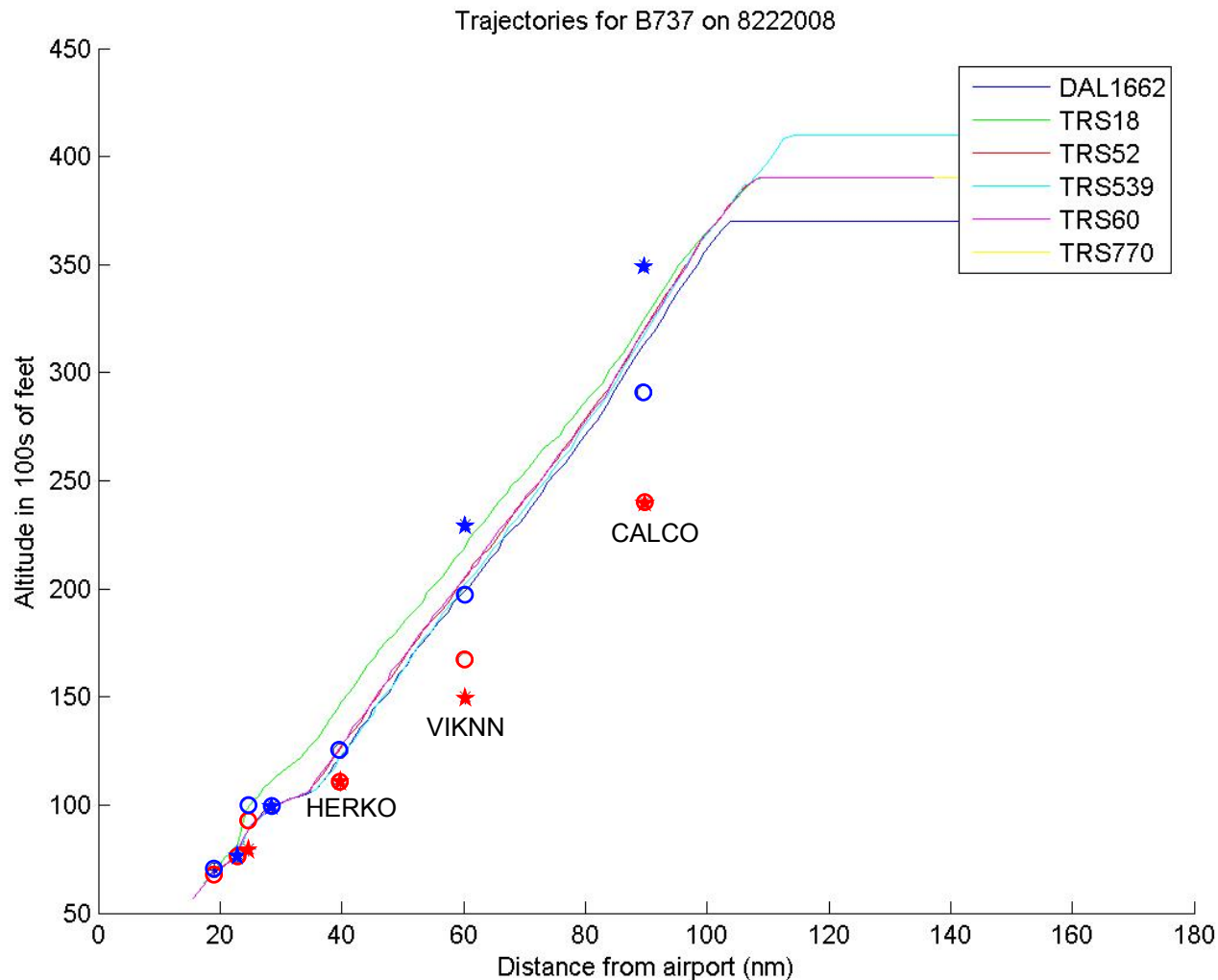
Sample Day Trajectory Plot – 8/24/2008



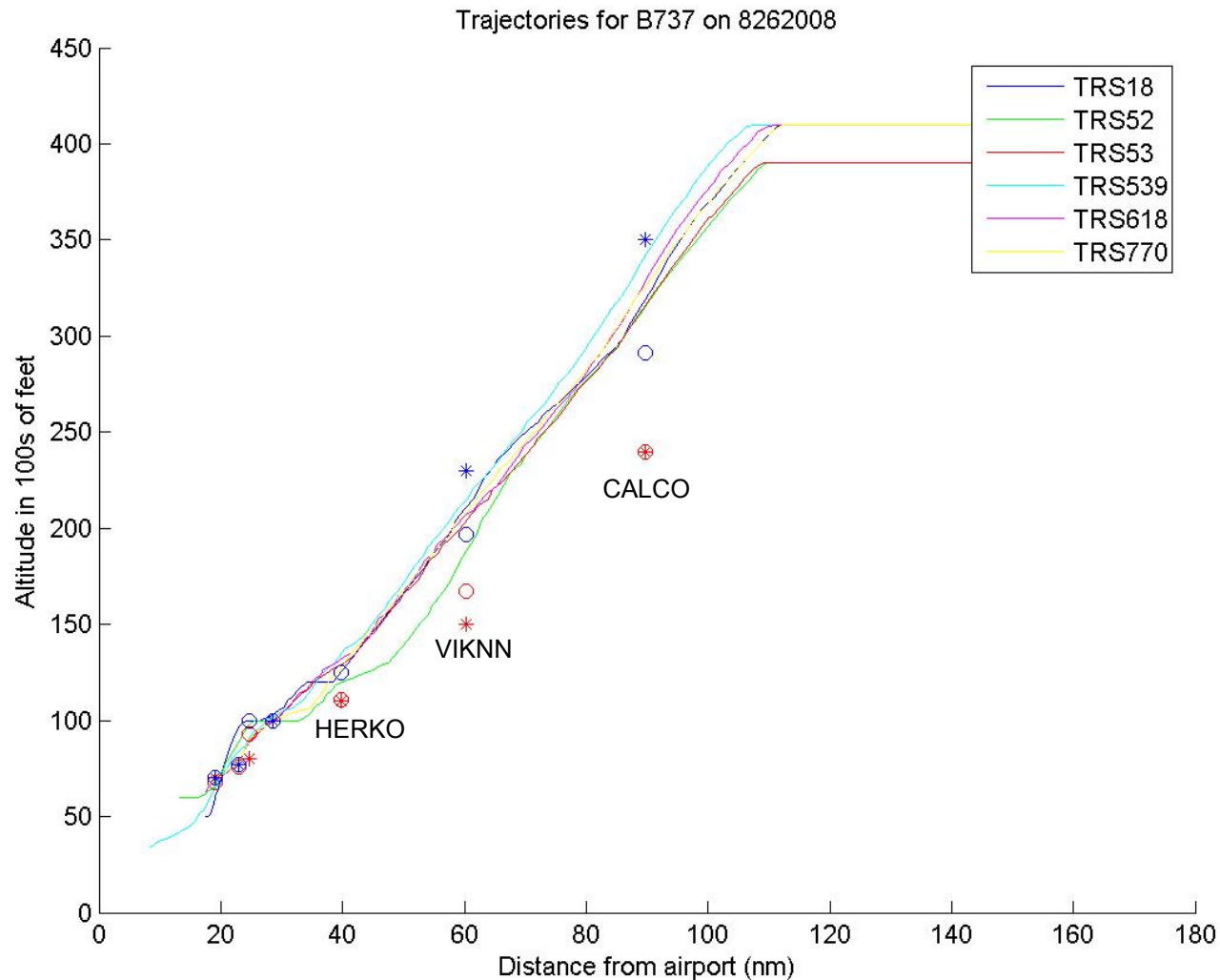
Sample Day Trajectory Plot – 9/13/2008



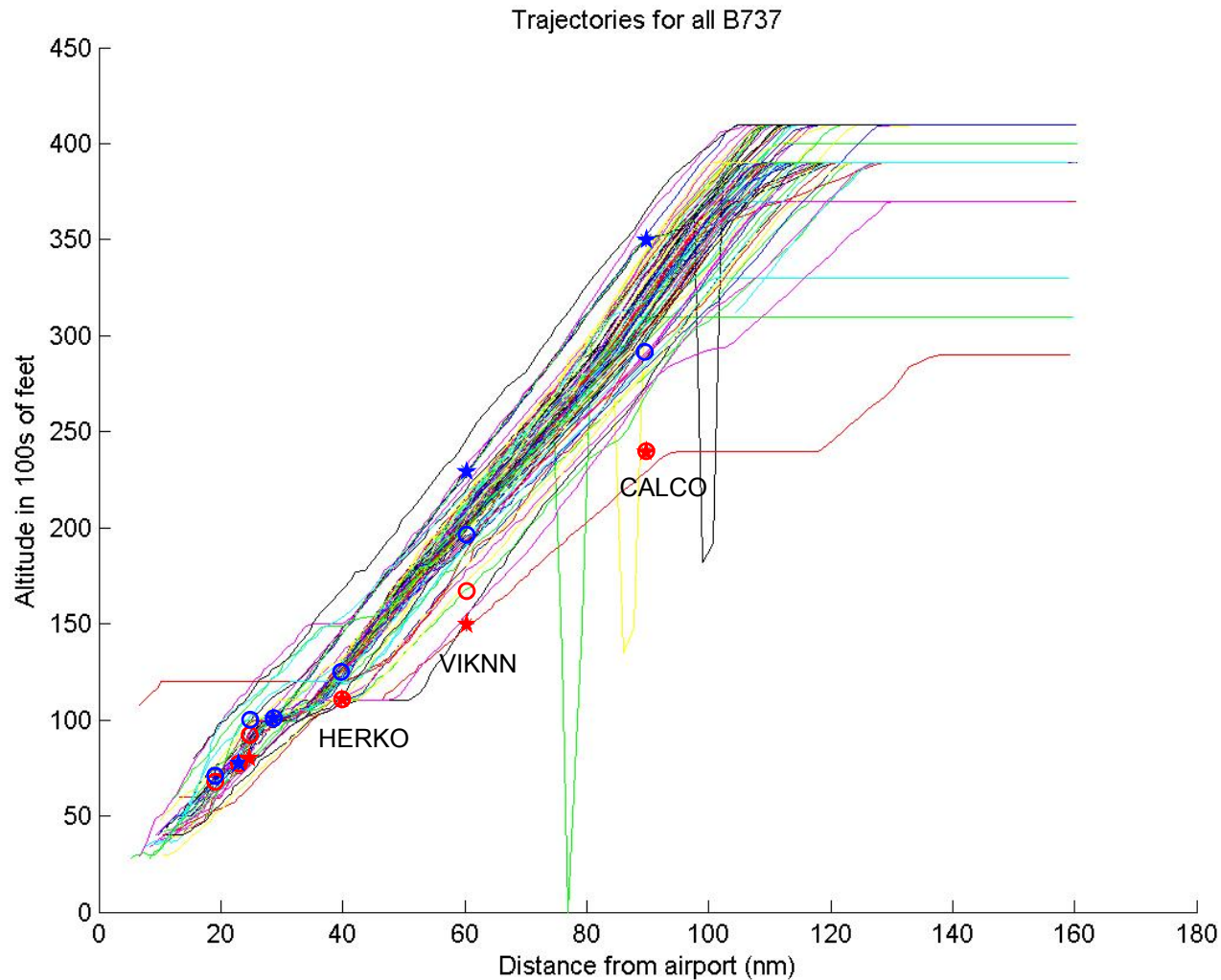
Sample B737-700 Trajectory Plot – 8/22/2008



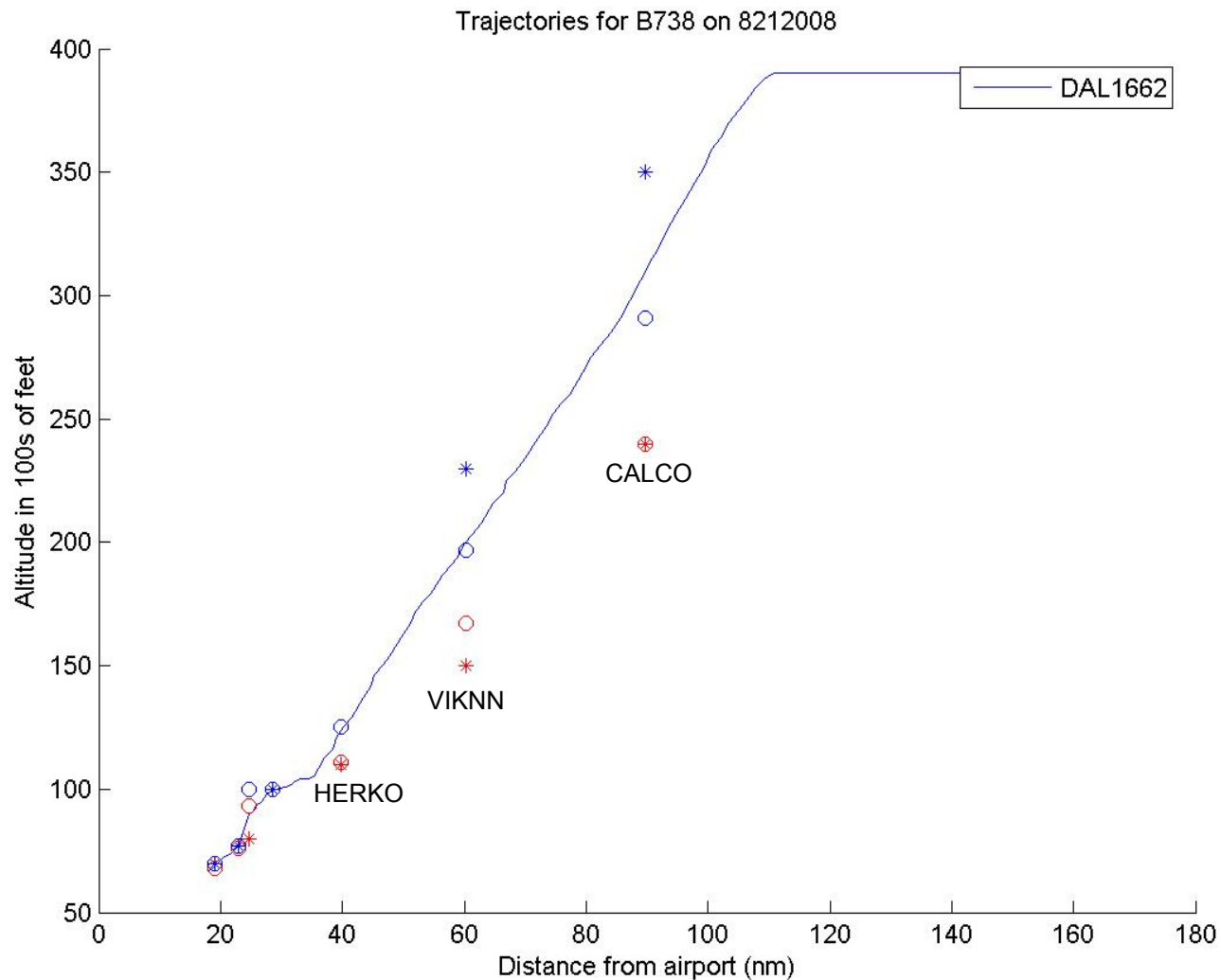
Sample B737-700 Trajectory Plot – 8/26/2008



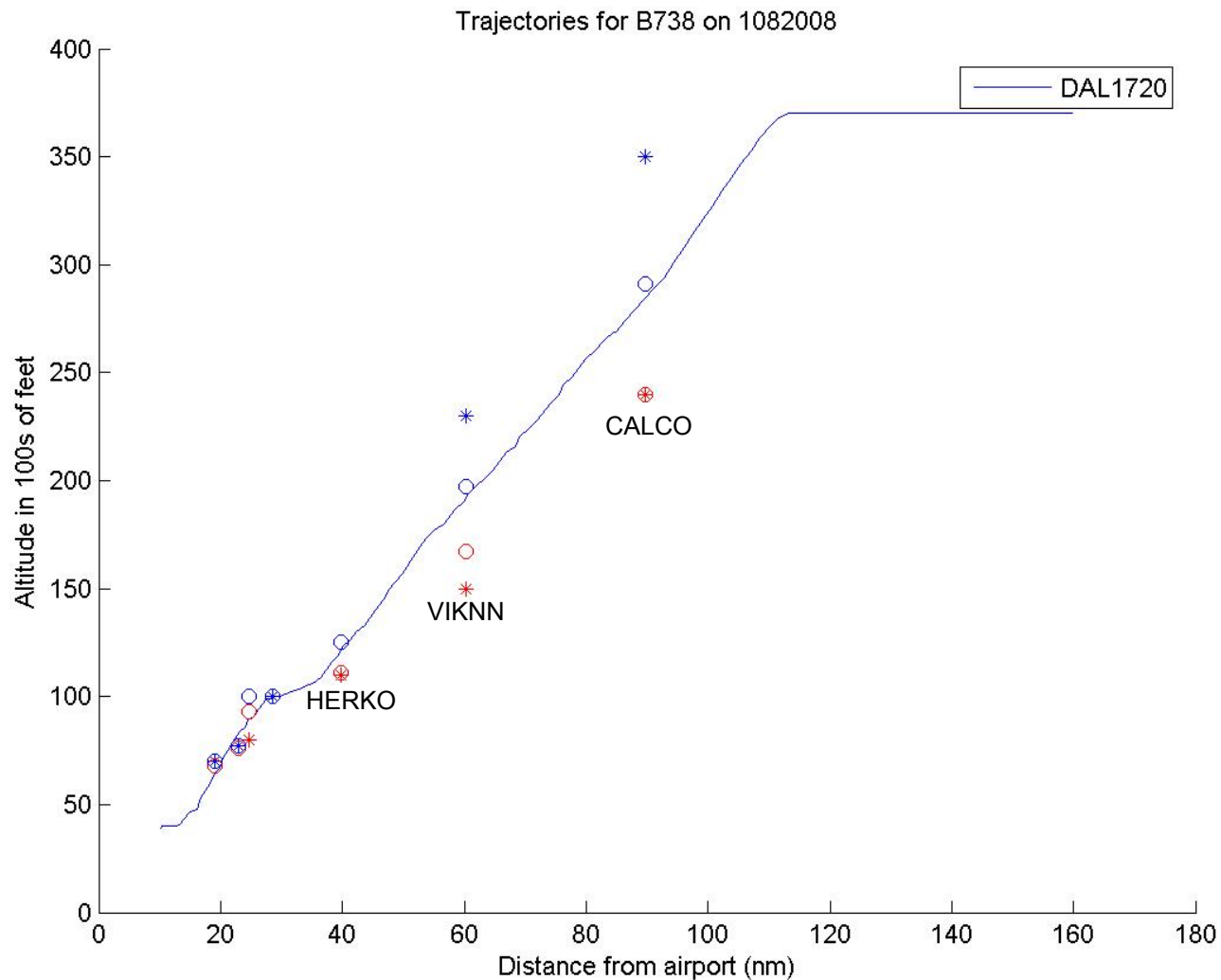
All B737-700 Trajectories Plot.



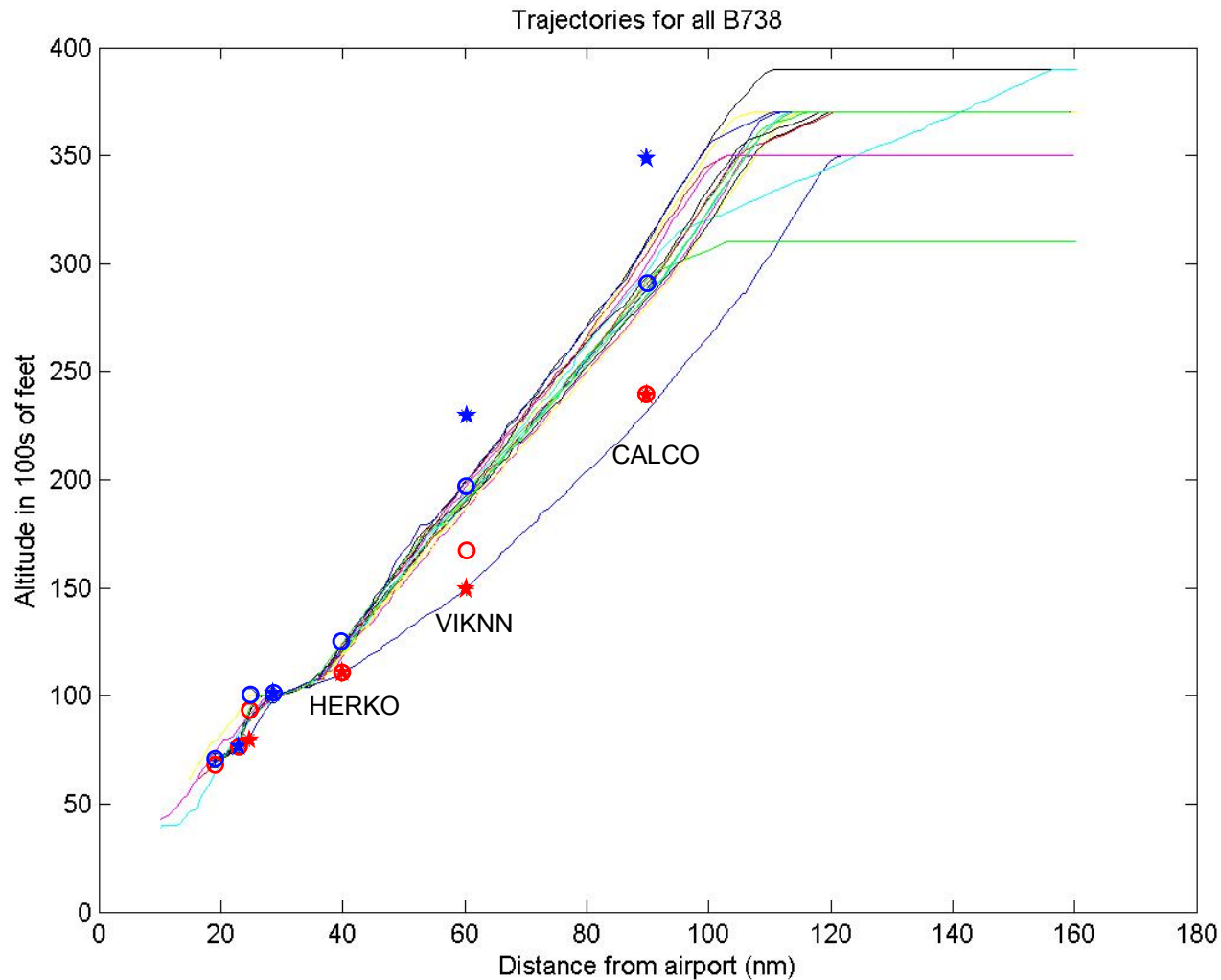
Sample B737-800 Trajectory Plot – 8/21/2008



Sample B737-800 Trajectory Plot – 10/8/2008



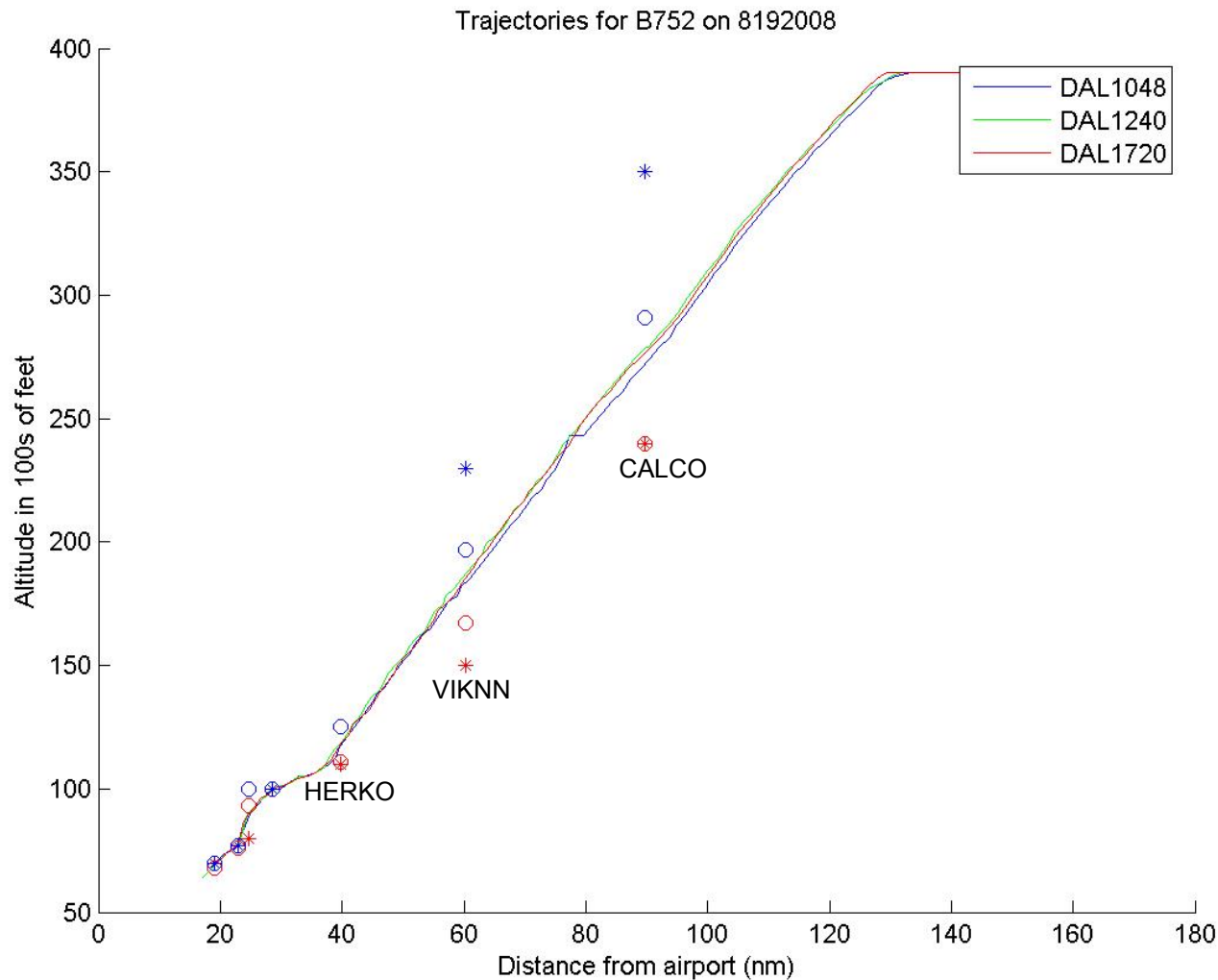
All B737-800 Trajectories Plot.



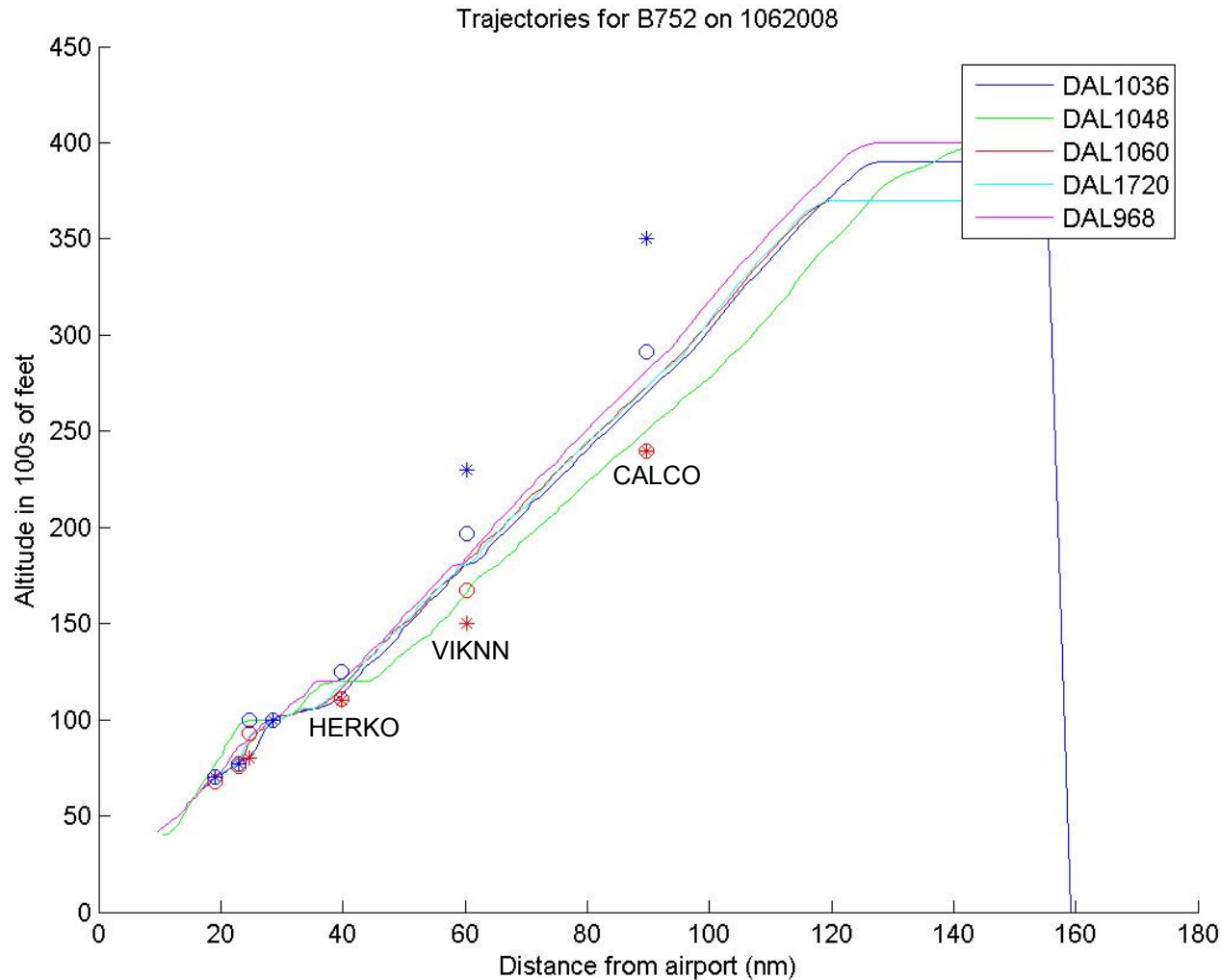
Why are the B737s out of predicted bounds?

- ❖ Cruise altitude (>FL350).
- ❖ FMS differences (manufacturer).
- ❖ Wind variations over a period of days.
- ❖ Point of procedure execution.
- ❖ Aircraft characteristics (B737-7 vs. B737-8).
- ❖ Possible inherent radar inaccuracy.

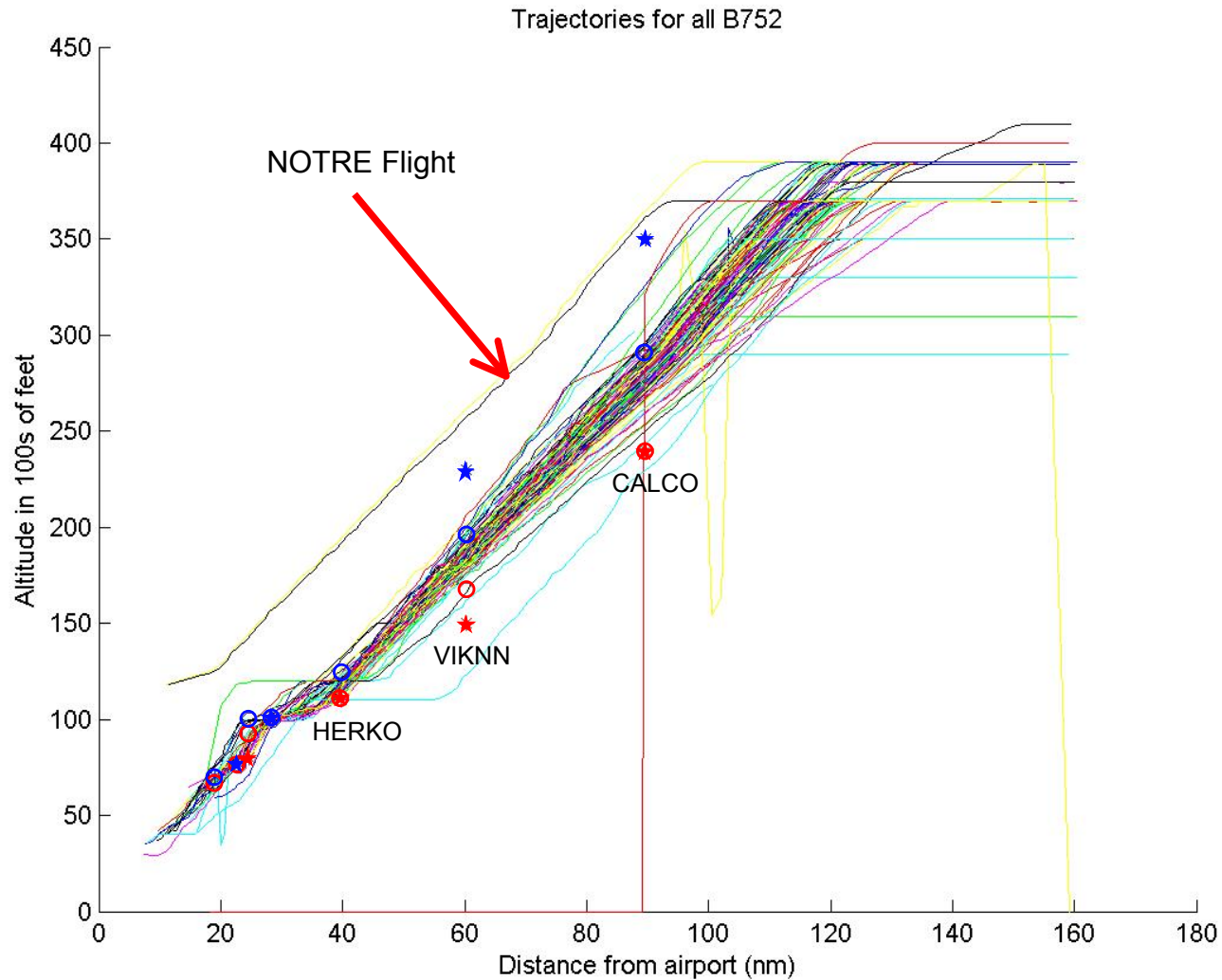
Sample B757-200 Trajectory Plot – 8/19/2008



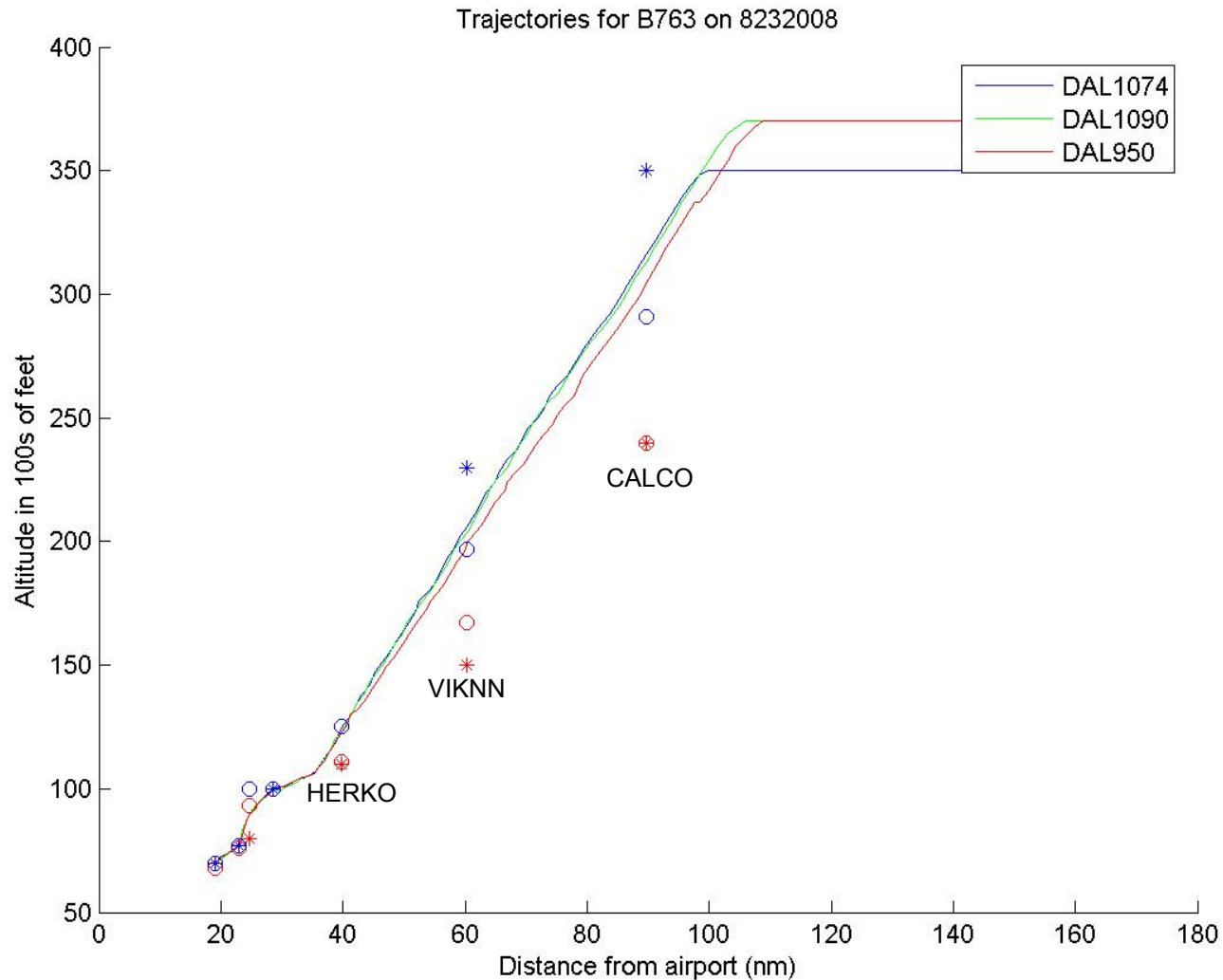
Sample B757-200 Trajectory Plot – 10/6-2008



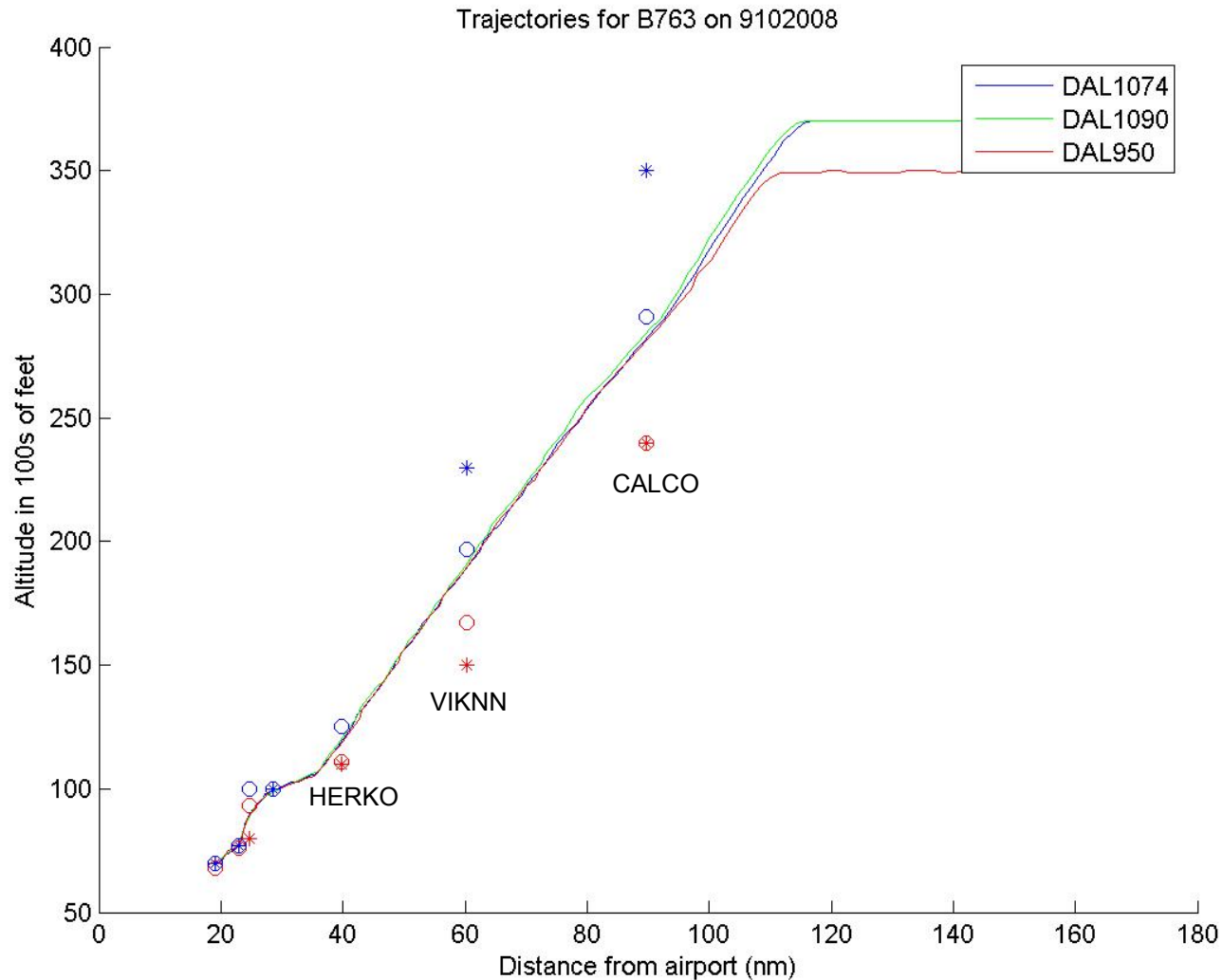
All B757-200 Trajectories Plot.



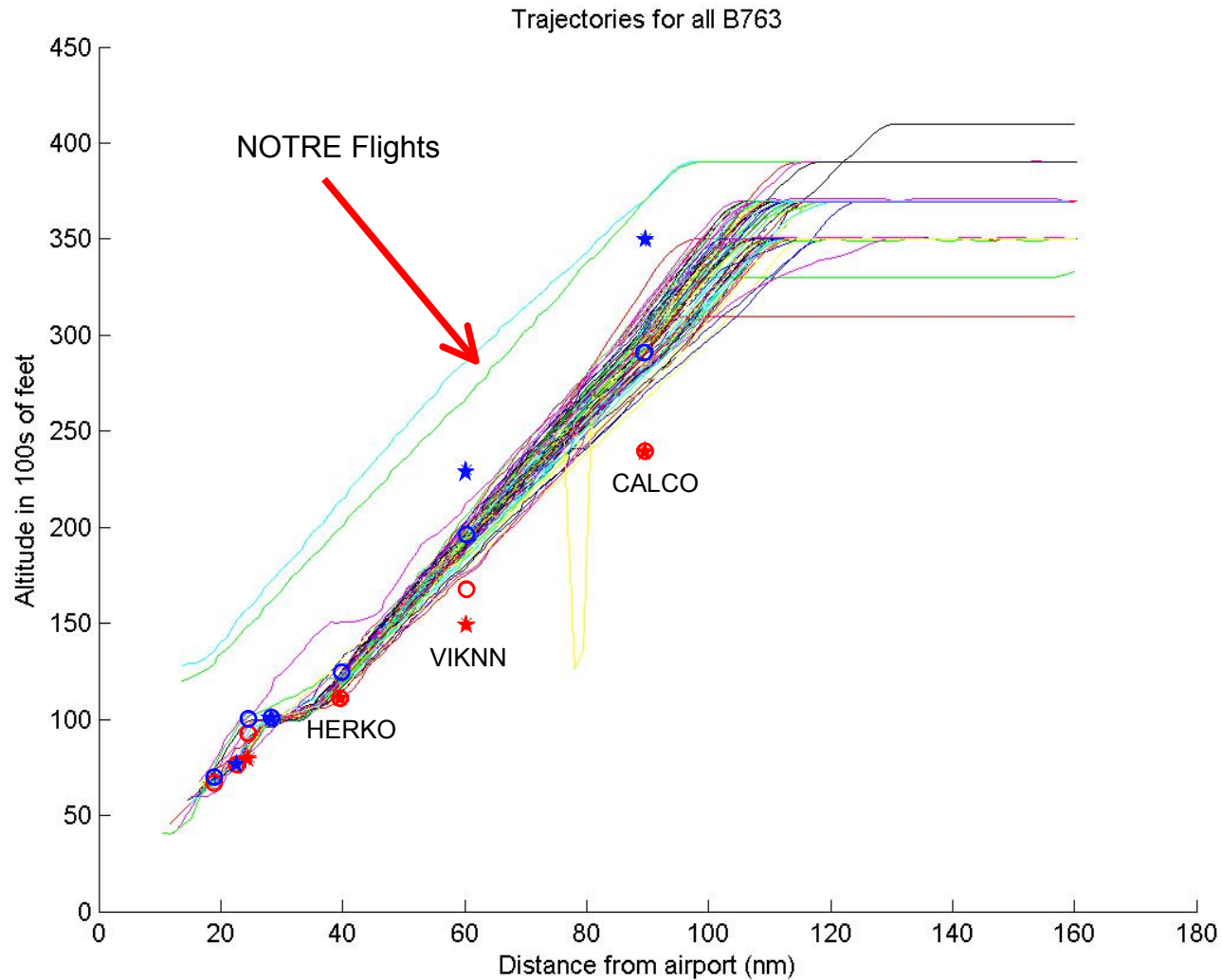
Sample B767-300 Trajectory Plot



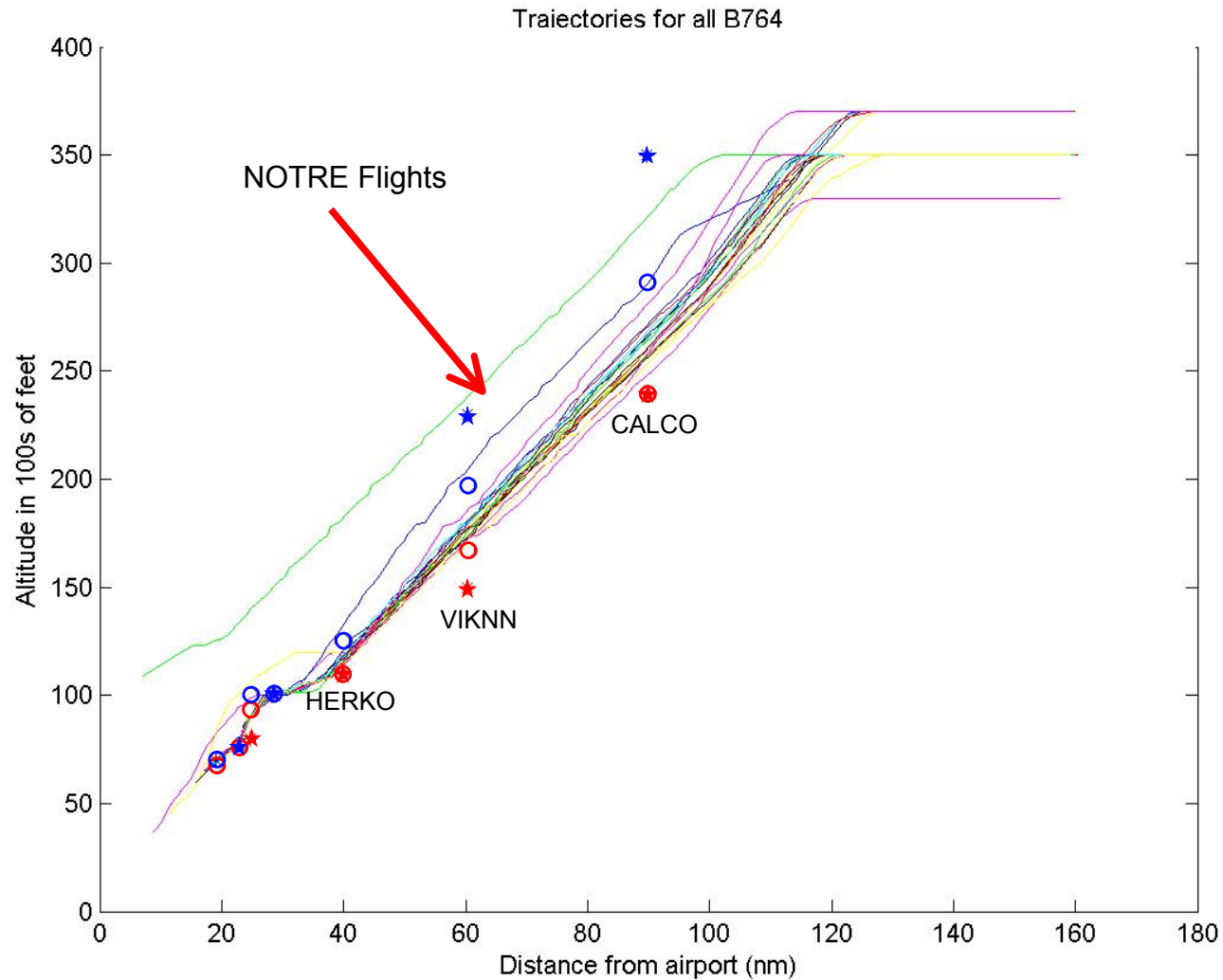
Sample B767-300 Trajectory Plot



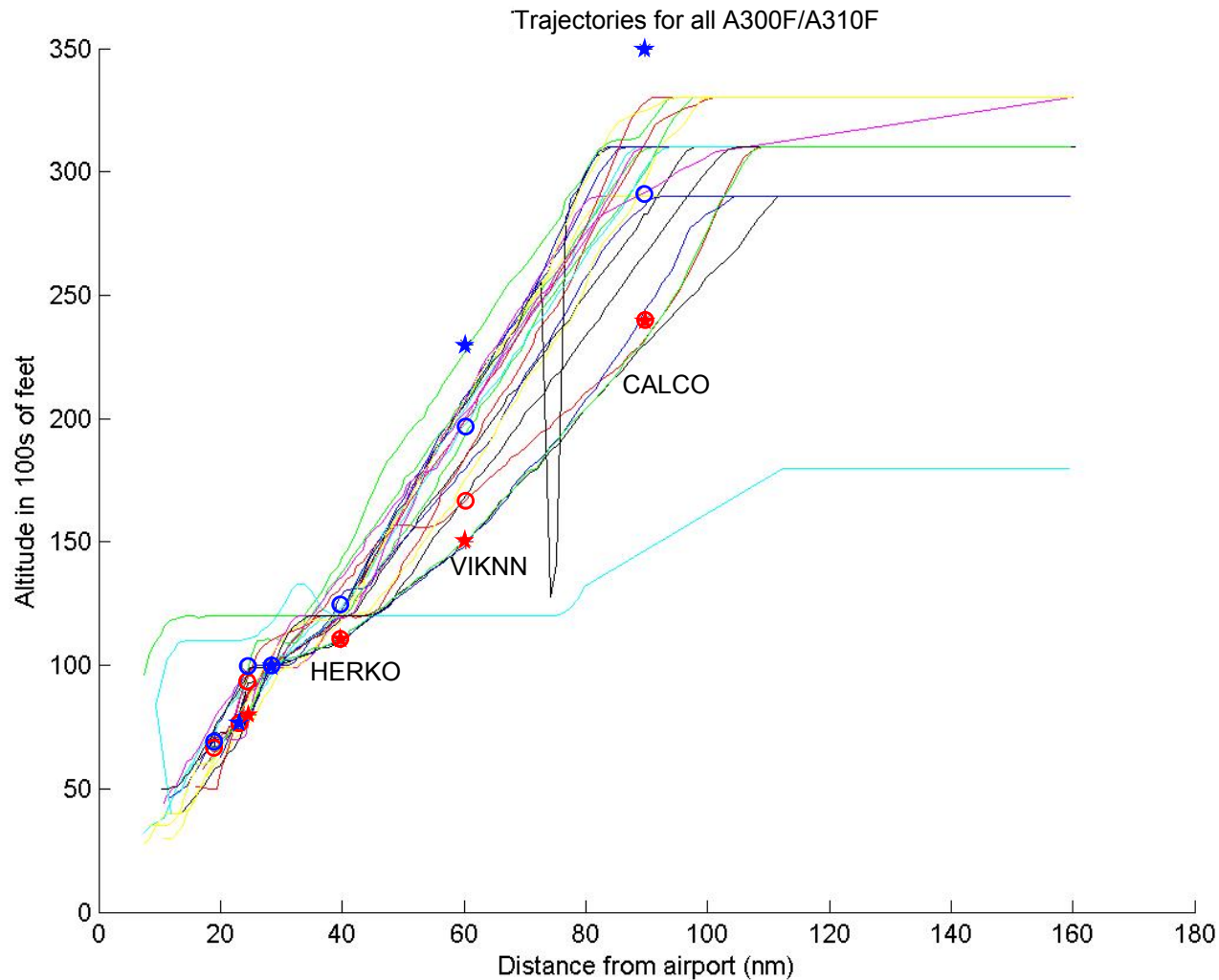
All B767-300 Trajectories Plot.



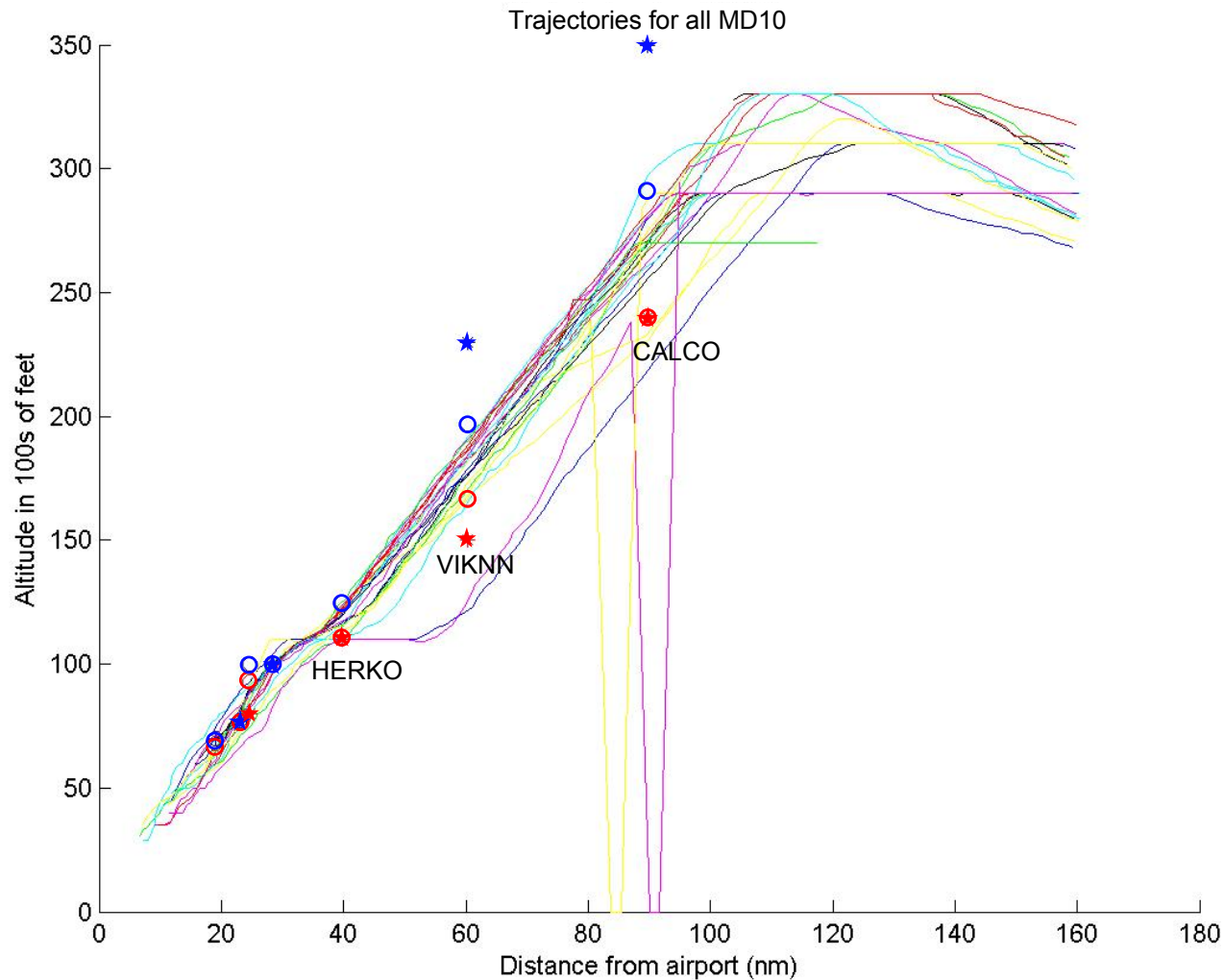
All B767-400ER Trajectories Plot.



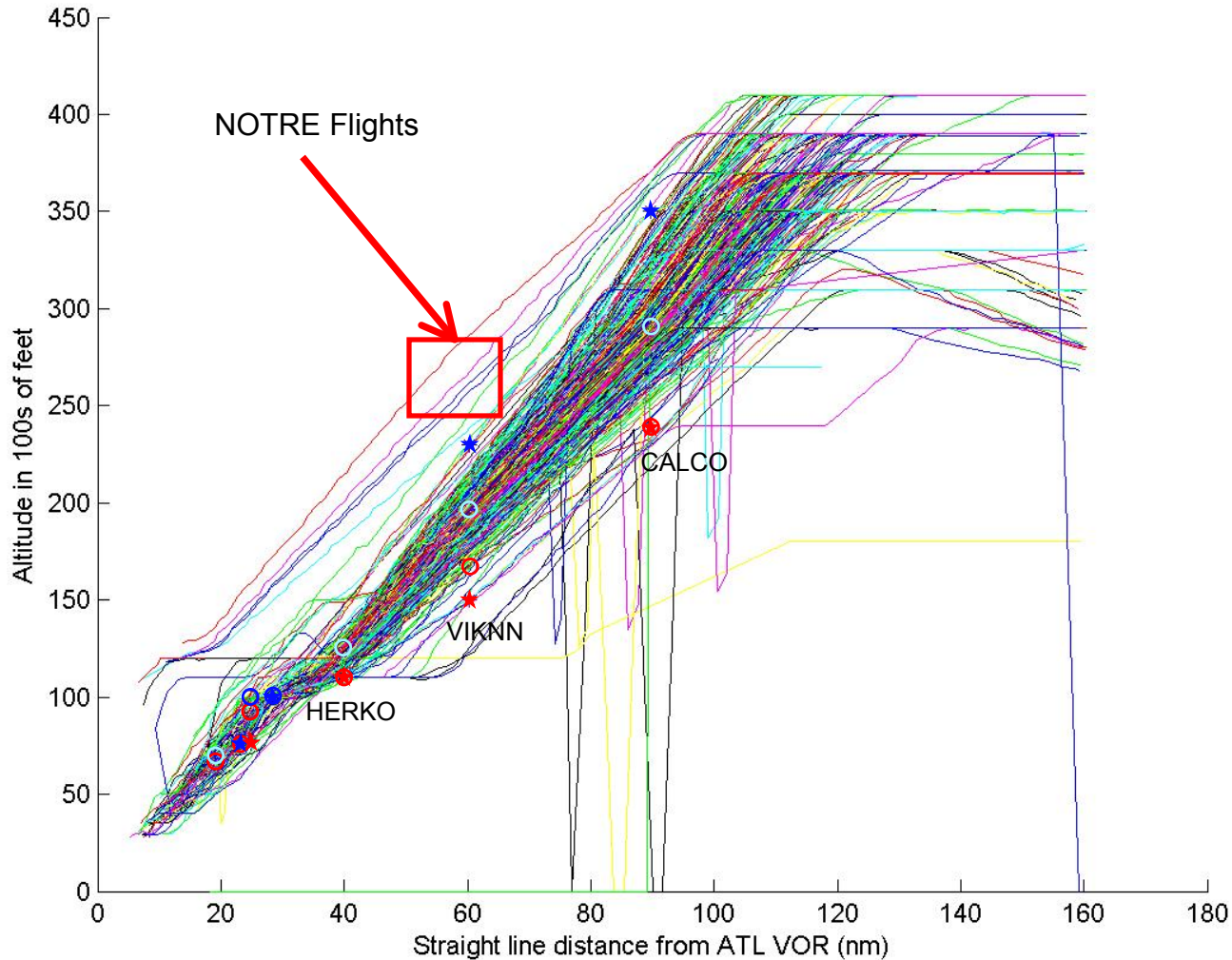
All A300F/A310F Trajectories Plot.



All MD10 Trajectories Plot.



All Aircraft Trajectories plot.

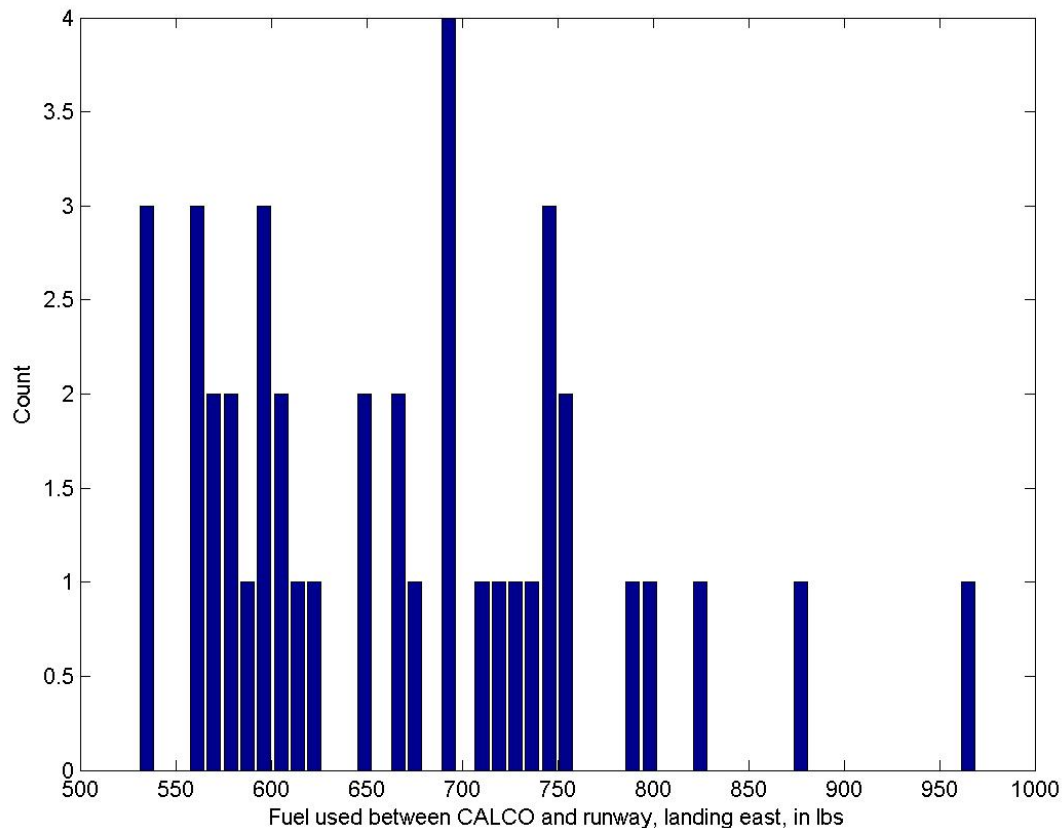


Preliminary Fuel Usage Analysis

- ❖ **FOQA data obtained from 58, August 2008, AirTran flights which flew the CDA.**
- ❖ **MATLAB used to calculate amount of fuel used from CALCO to touchdown.**
- ❖ **Fuel-flow recorded every second in lbs/hr.**
- ❖ **Touchdown point determined when AIR-GROUND switch changes from 0 to 1.**
- ❖ **Awaiting more 'Control Data' to make accurate calculations regarding total amount fuel saved.**

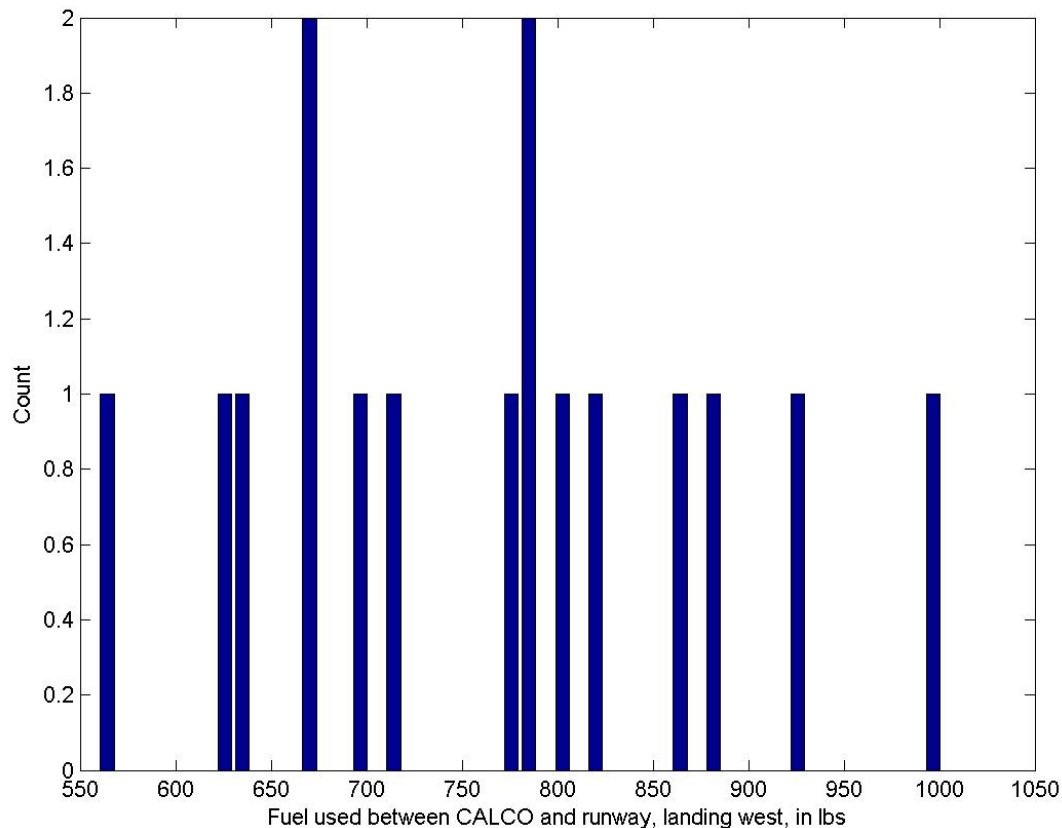
Fuel Usage for East Operations.

- ❖ Data for 41 flights.
- ❖ Average usage = 668 lbs from CALCO.



Fuel Usage for West Operations.

- ❖ Data for 17 flights.
- ❖ Average usage = 763 lbs from CALCO.



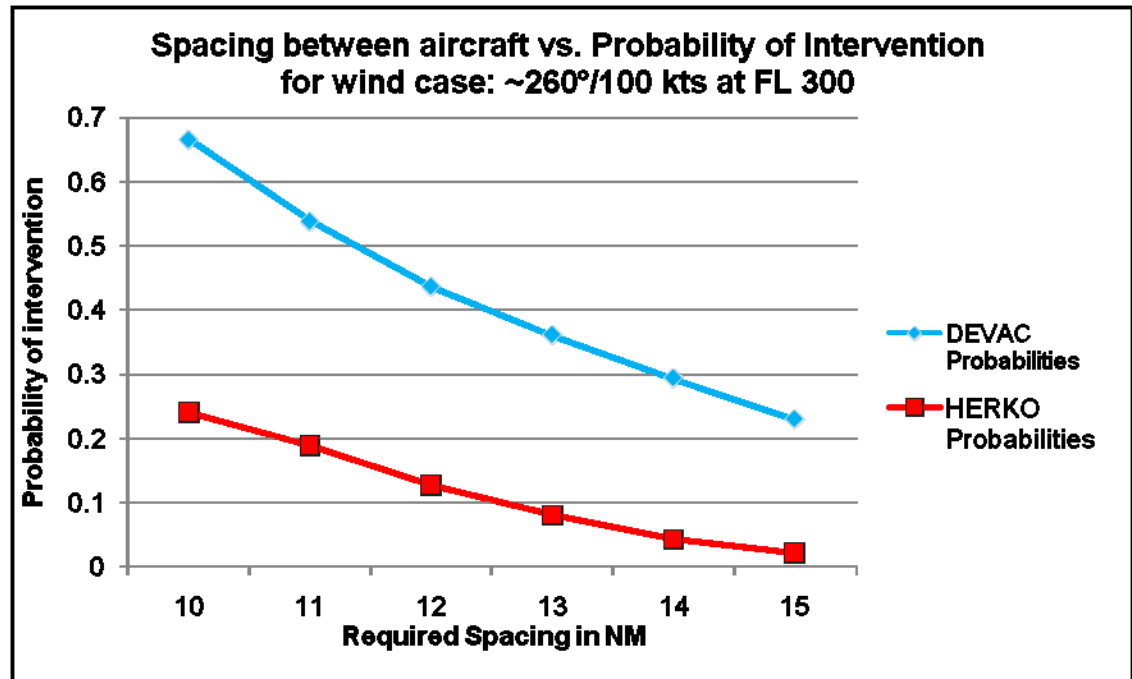
Spacing matrices and intervention probabilities with wind case: ~260°/100 kts at FL 300.

Trailing Aircraft	Leading Aircraft			
		B738	B752	B763
	B738	10	15	15
	B763	9	15	15

DEVAC required spacings

Trailing Aircraft	Leading Aircraft			
		B738	B752	B763
	B738	8	12	14
	B763	6	11	11

HERKO required spacings



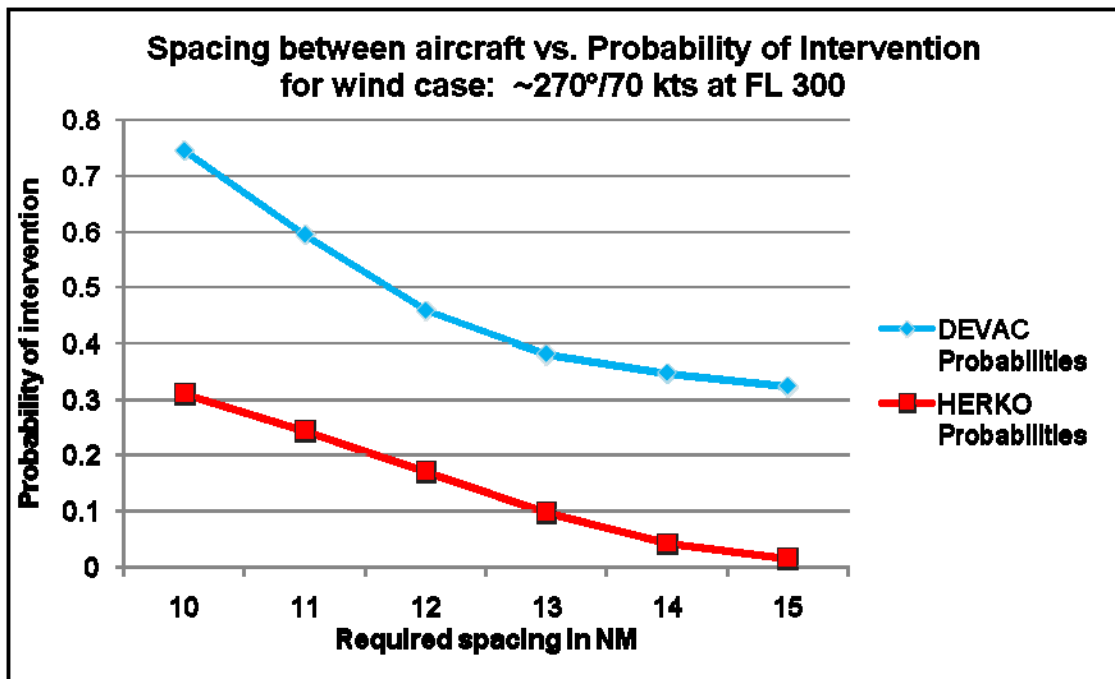
Spacing matrices and intervention probabilities with wind case: ~270°/70 kts at FL 300.

Trailing Aircraft	Leading Aircraft			
		B738	B752	B763
	B738	15	15	15
	B763	15	15	15

DEVAC required spacings

Trailing Aircraft	Leading Aircraft			
		B738	B752	B763
	B738	8	13	14
	B763	8	13	11

HERKO required spacings



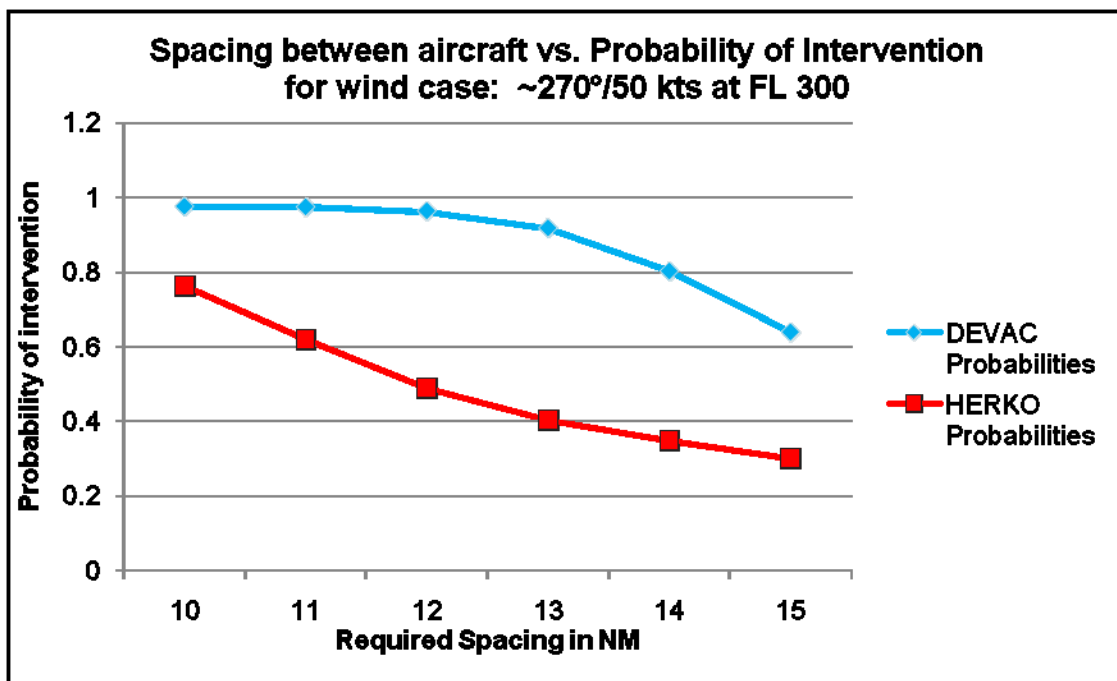
Spacing matrices and intervention probabilities with wind case: ~270°/50 kts at FL 300 .

Trailing Aircraft	Leading Aircraft			
		B738	B752	B763
	B738	10	15	15
	B763	11	15	15

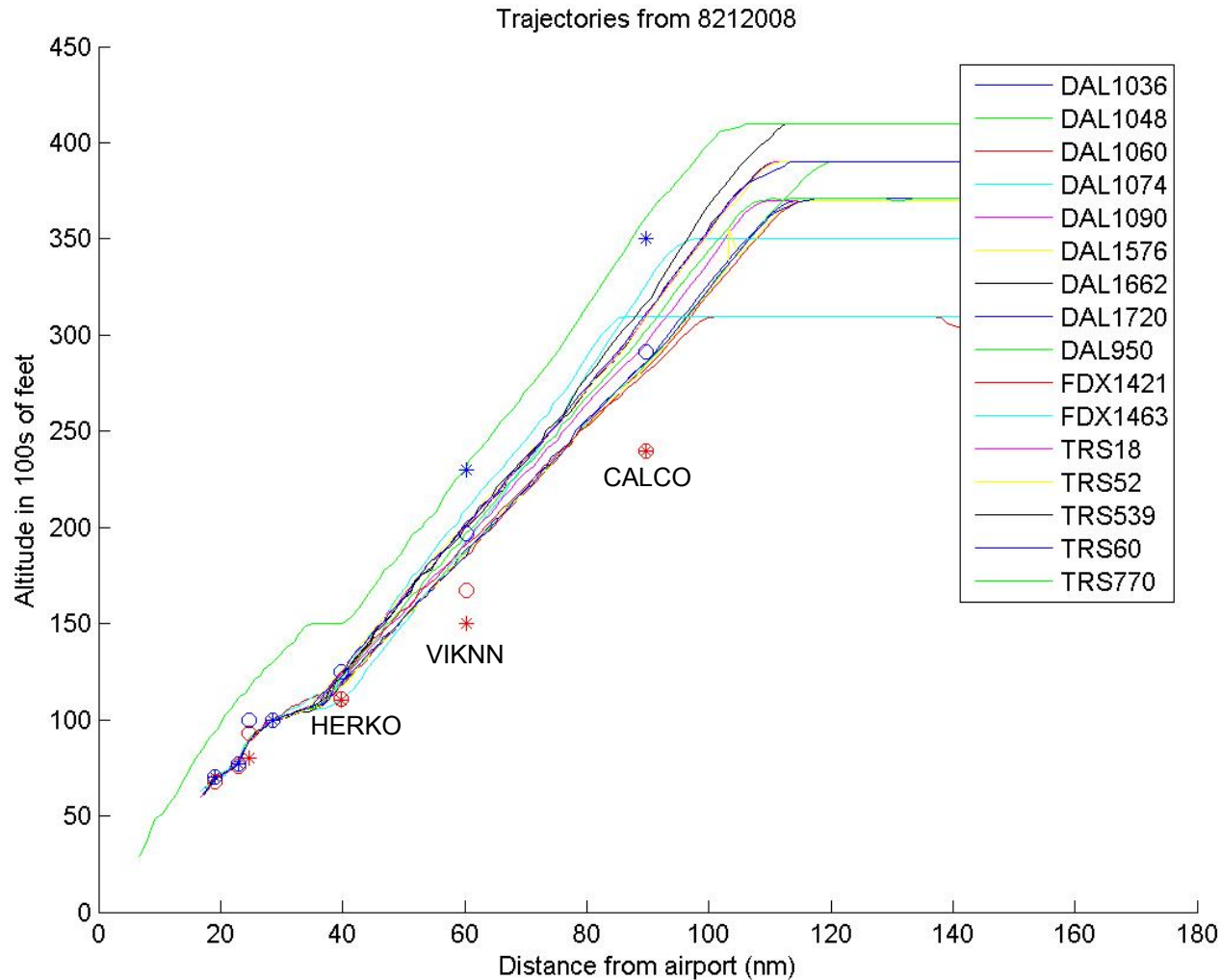
DEVAC required spacings

Trailing Aircraft	Leading Aircraft			
		B738	B752	B763
	B738	12	15	15
	B763	12	15	15

HERKO required spacings



Backup - Sample Day Trajectory Plot – 8/21/2008



Backup - Sample B737-700 Trajectory Plot – 9/18/2008

