ACR Slate Recommendations Analyses and Requests:

- Initial Evaluation of 6,000 foot Downwind
- Collective Analyses Groupings

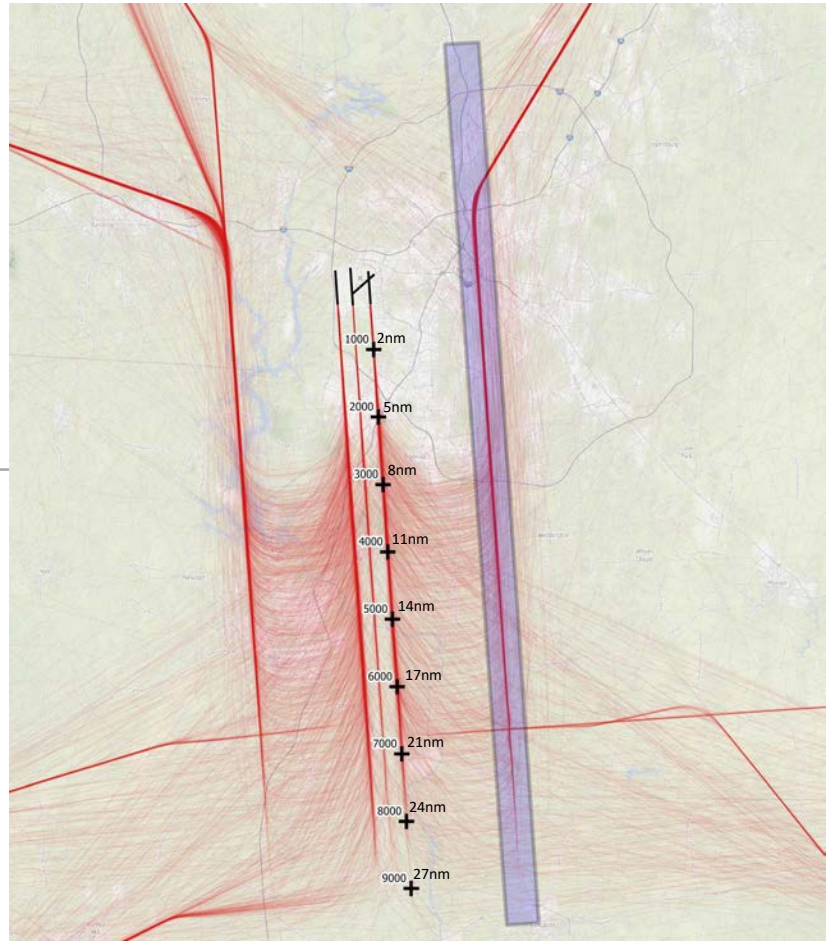
For ACR Review, Understanding, and Discussion

November 20, 2019

ACR Request: Initial Analysis of 6,000 Foot Downwinds

Request of the ACR at the

October 2019 ACR meeting



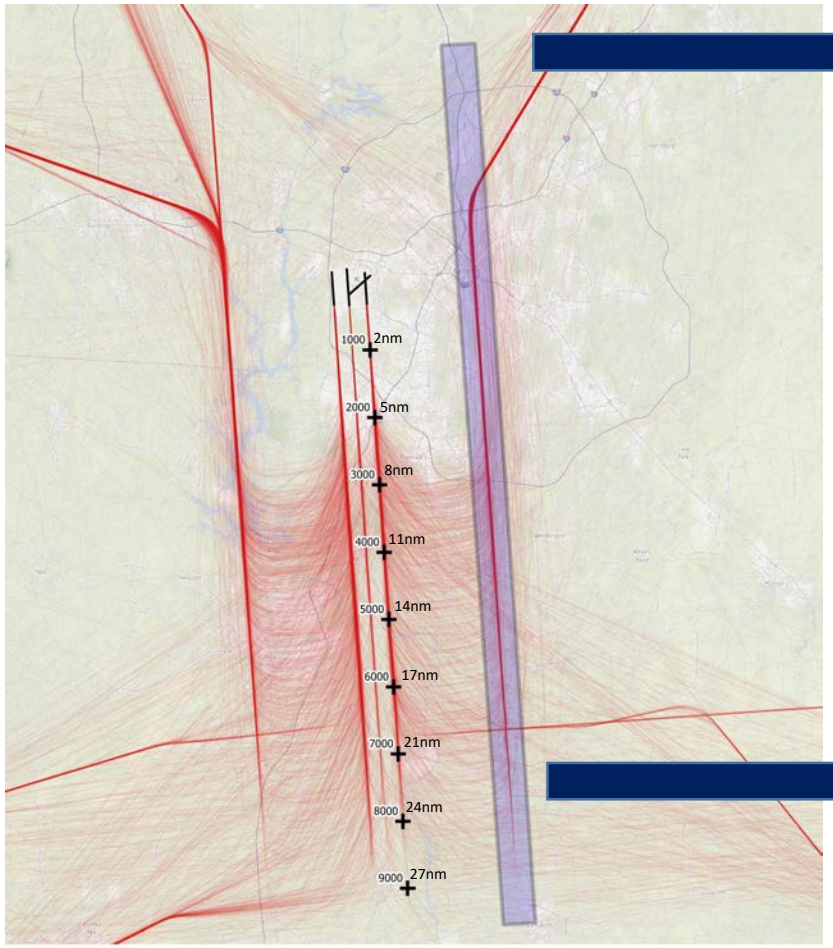
ACR Request:
Initial Analysis of 6,000 foot Downwinds

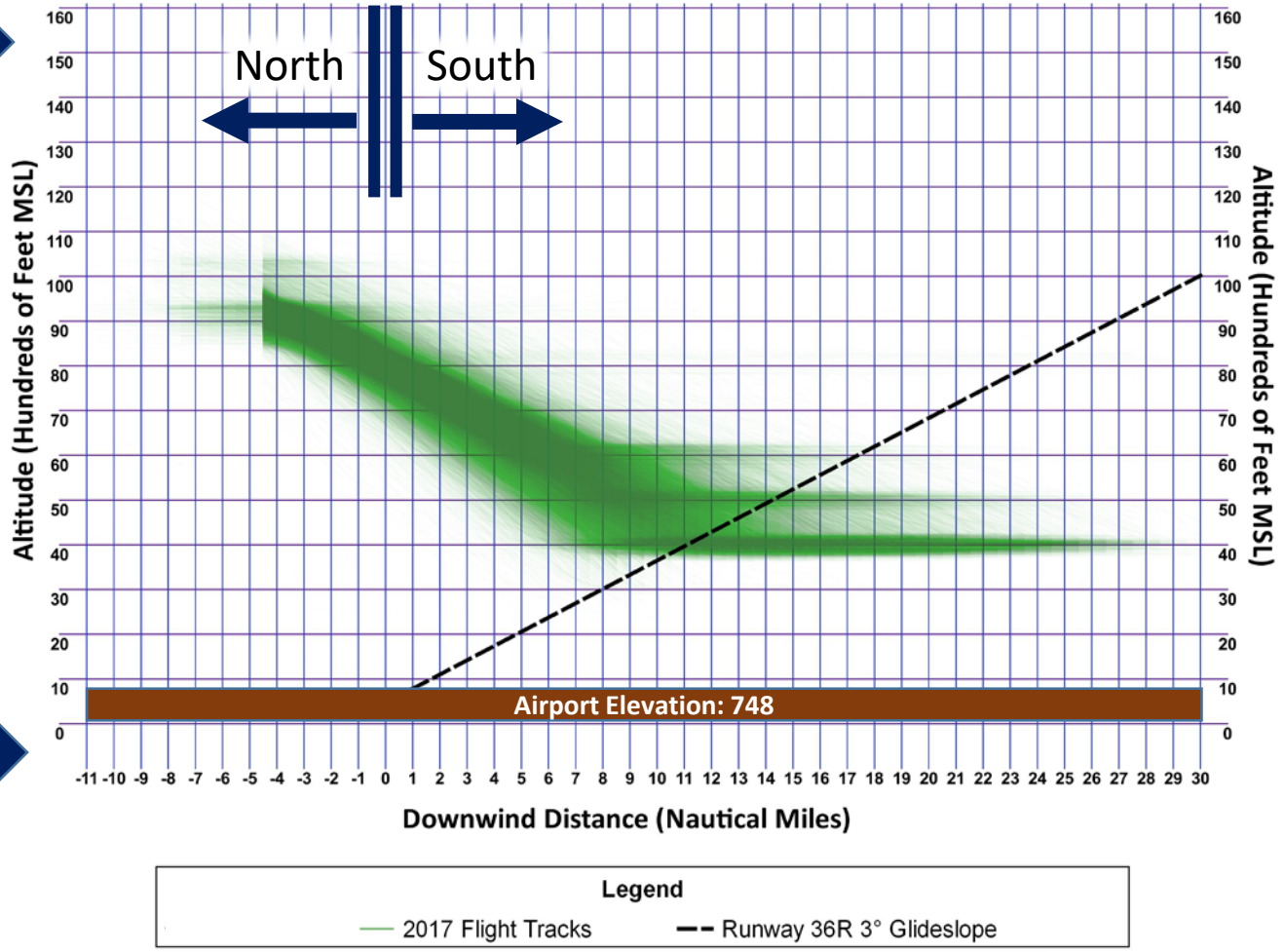
- ACR requested initial analysis of increasing/maintaining aircraft altitudes on the downwind legs at 6,000 feet
- HMMH previously analyzed downwind altitudes for the north flow east downwind flight tracks at the August 2018 ACR meeting
- Prior analysis included 2017-2018 (June 1, 2017 to May 31, 2018) radar data
  - Aircraft downwind altitudes have not changed since that time
- Likewise, altitudes on the north flow east downwind follow a similar pattern as the north flow west downwind and south flow downwind flight paths
- Due to similarities of ACR request to our prior analysis, we are revisiting that analysis to review the feasibility of increasing/maintaining aircraft altitudes at 6,000 feet on the downwind flight path segments

Analysis Overview:
Initial Analysis of 6,000 foot Downwinds

- Previously constructed series of analysis gates on north flow east downwind at 0.5 nautical mile intervals and:
  - Analyzed aircraft altitudes as they passed through each gate
  - Plotted altitudes for each aircraft flight track as they flew along east downwind
    - X Axis represents distance north and south of airport center point (negative distances=north, positive distances=south)
    - Y Axis represents altitude above Mean Sea Level (MSL) in hundreds of feet
    - Flight track altitude profiles depicted in green, with darker shades representing greater density/concentration of aircraft altitude profiles and lighter shades representing less density/concentration
- *Note: The graphics show a three-degree glide/descent path for reference*

CLT North Flow East Downwind – 2017 Altitude Profiles

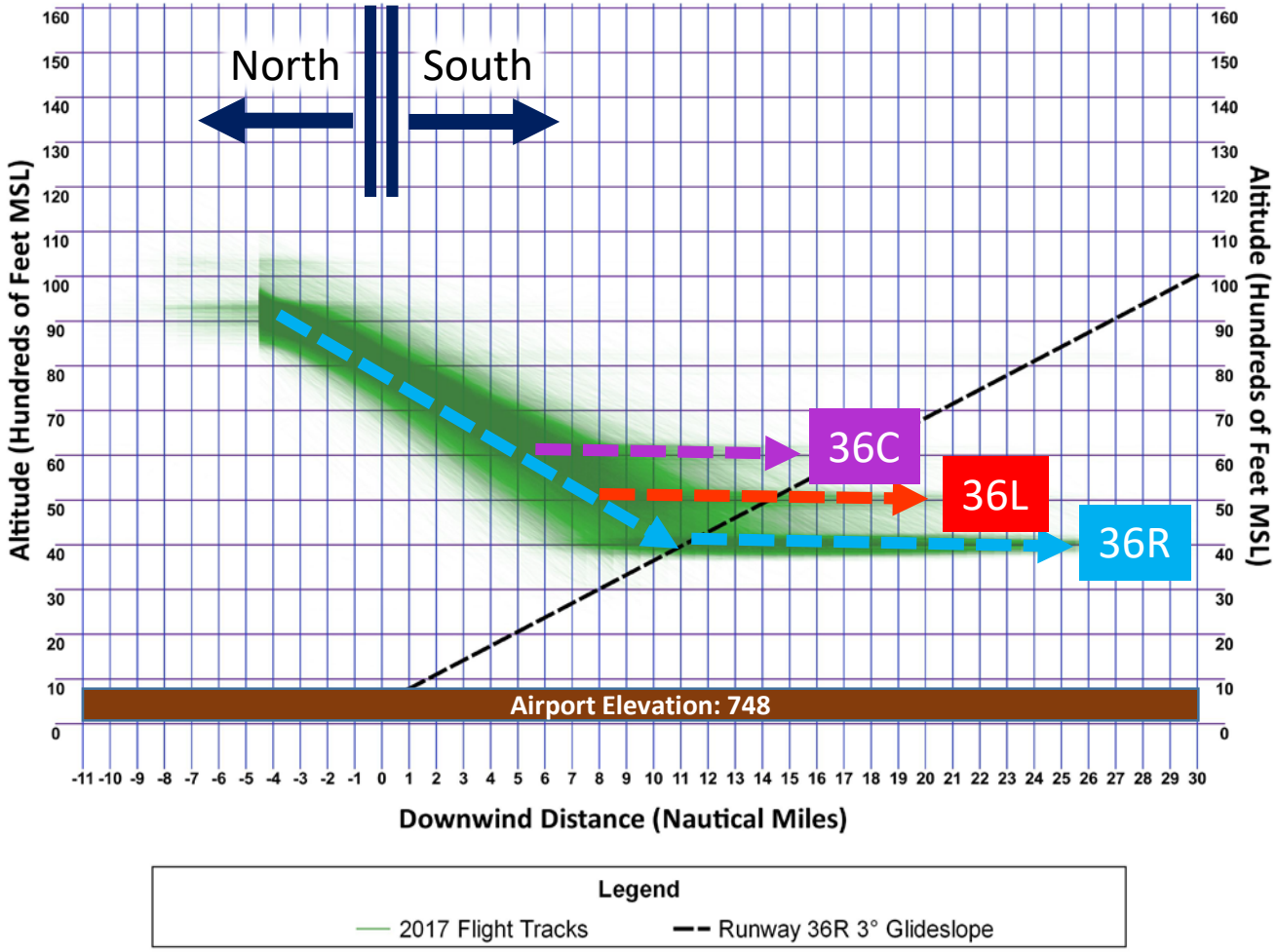




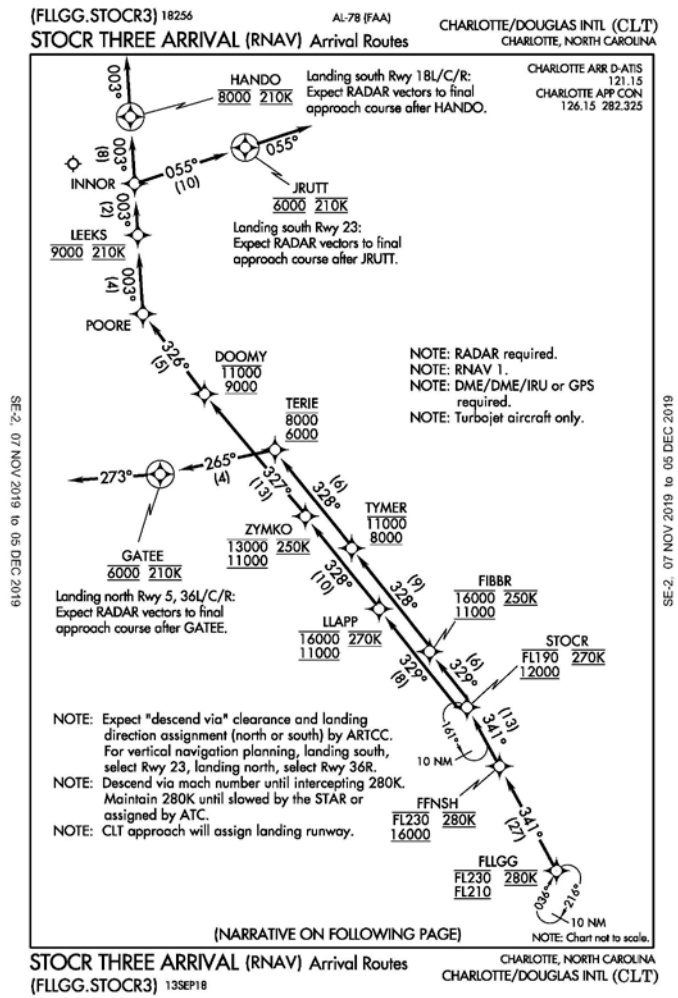
Observations:
Initial Analysis of 6,000 foot Downwinds

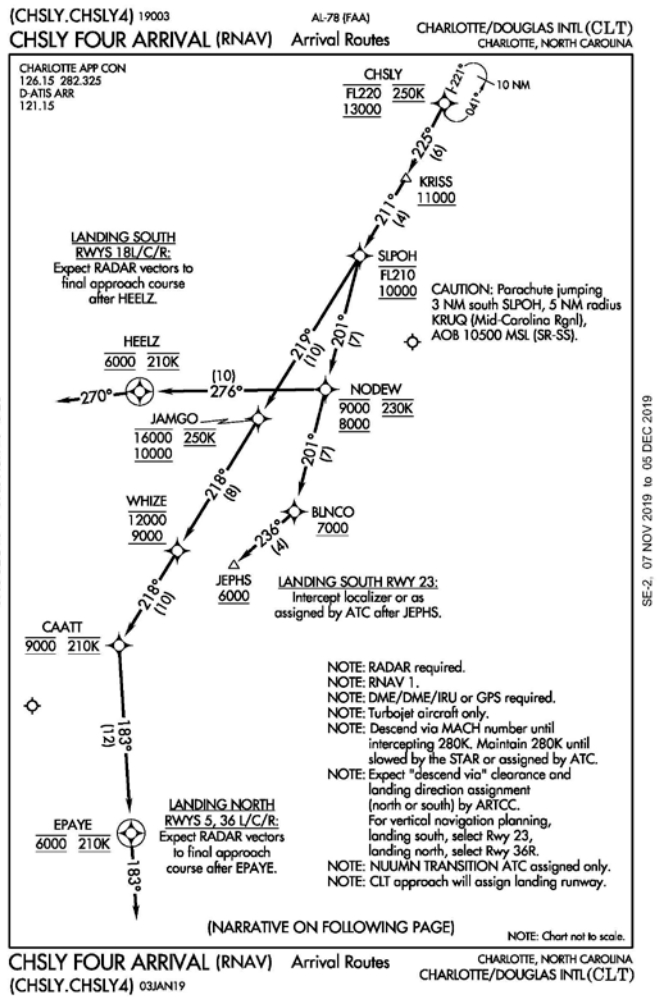
- Aircraft currently level off at 6,000 feet, 5,000 feet and 4,000 feet on the north flow east downwind before turning to intercept final approach
- These altitudes are related to maintaining aircraft vertical separation of 1,000 feet during turn on from the downwinds to the final approach course between the parallel runways
  - North Flow:
    - 36L: 5,000 feet
    - 36C: 6,000 feet
    - 36R: 4,000 feet
  - South Flow:
    - 18L: 4,000 feet
    - 18C: 6,000 feet
    - 18R: 5,000 feet
- These altitudes also provide separation from arrival aircraft on the base legs at 6,000 and 7,000 feet
- Altitudes are published by the FAA for the downwinds on some arrival procedures at 6,000 and 8,000 feet

CLT North Flow East Downwind – 2017 Altitude Profiles

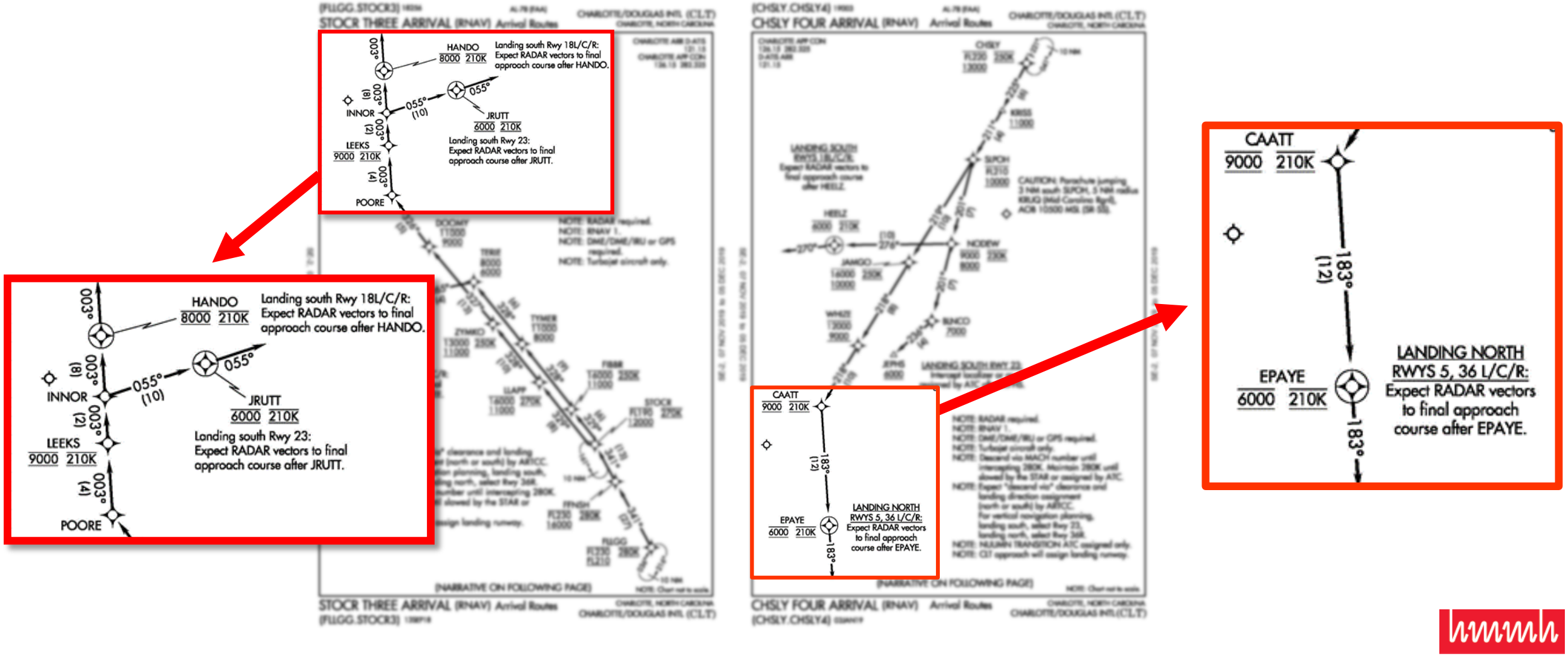


CLT Current FAA Published Arrival Procedures

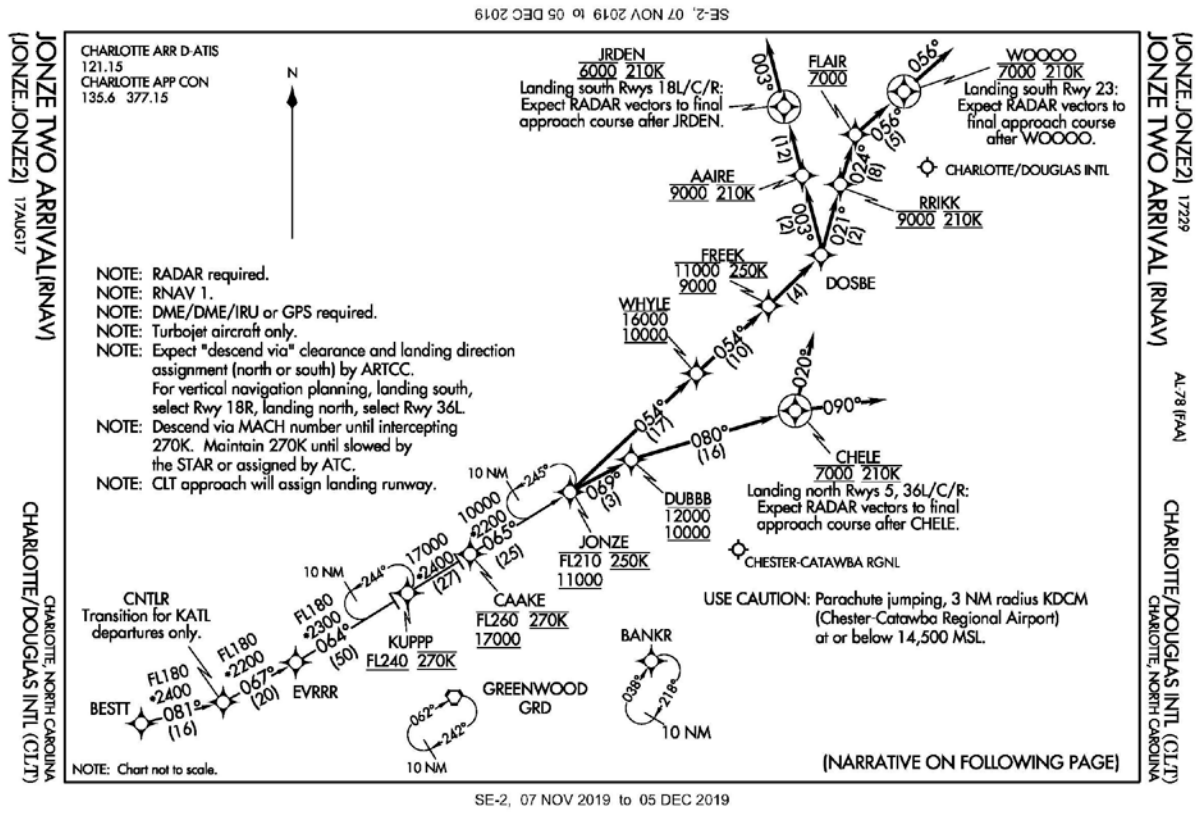


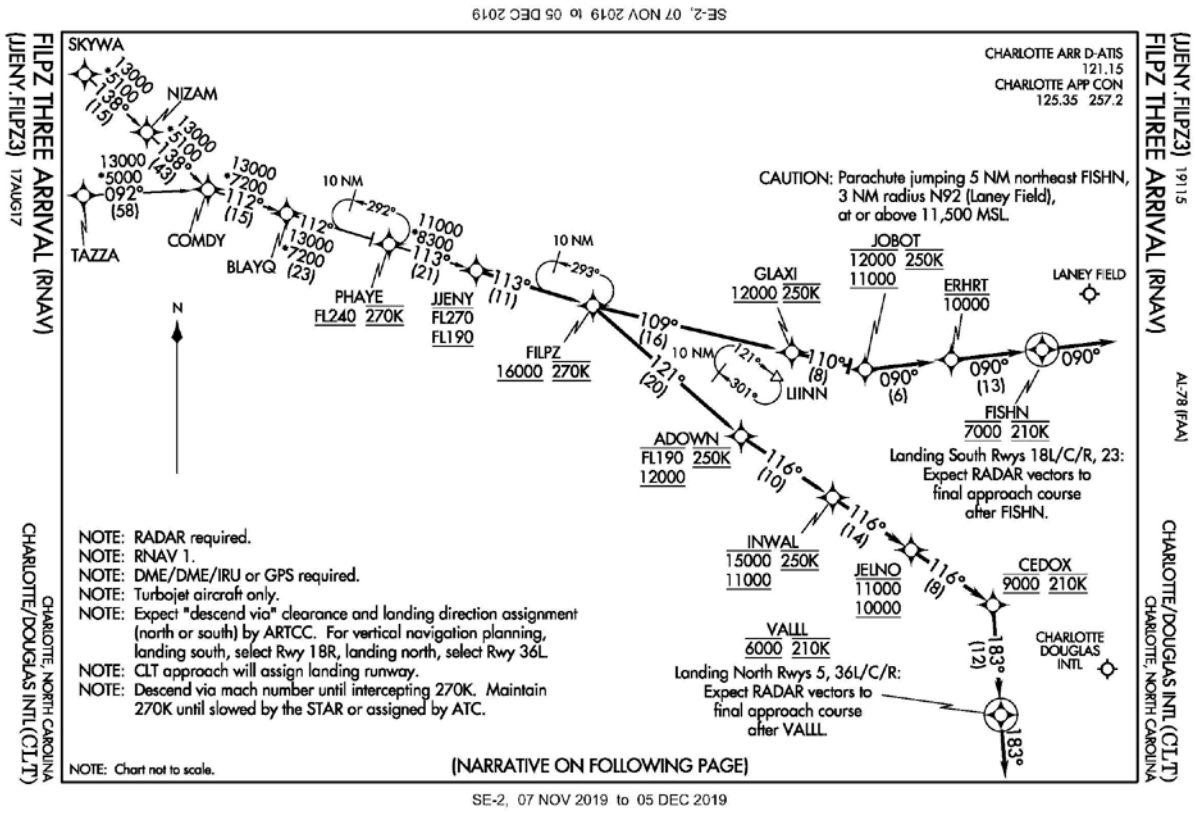


CLT Current FAA Published Arrival Procedures

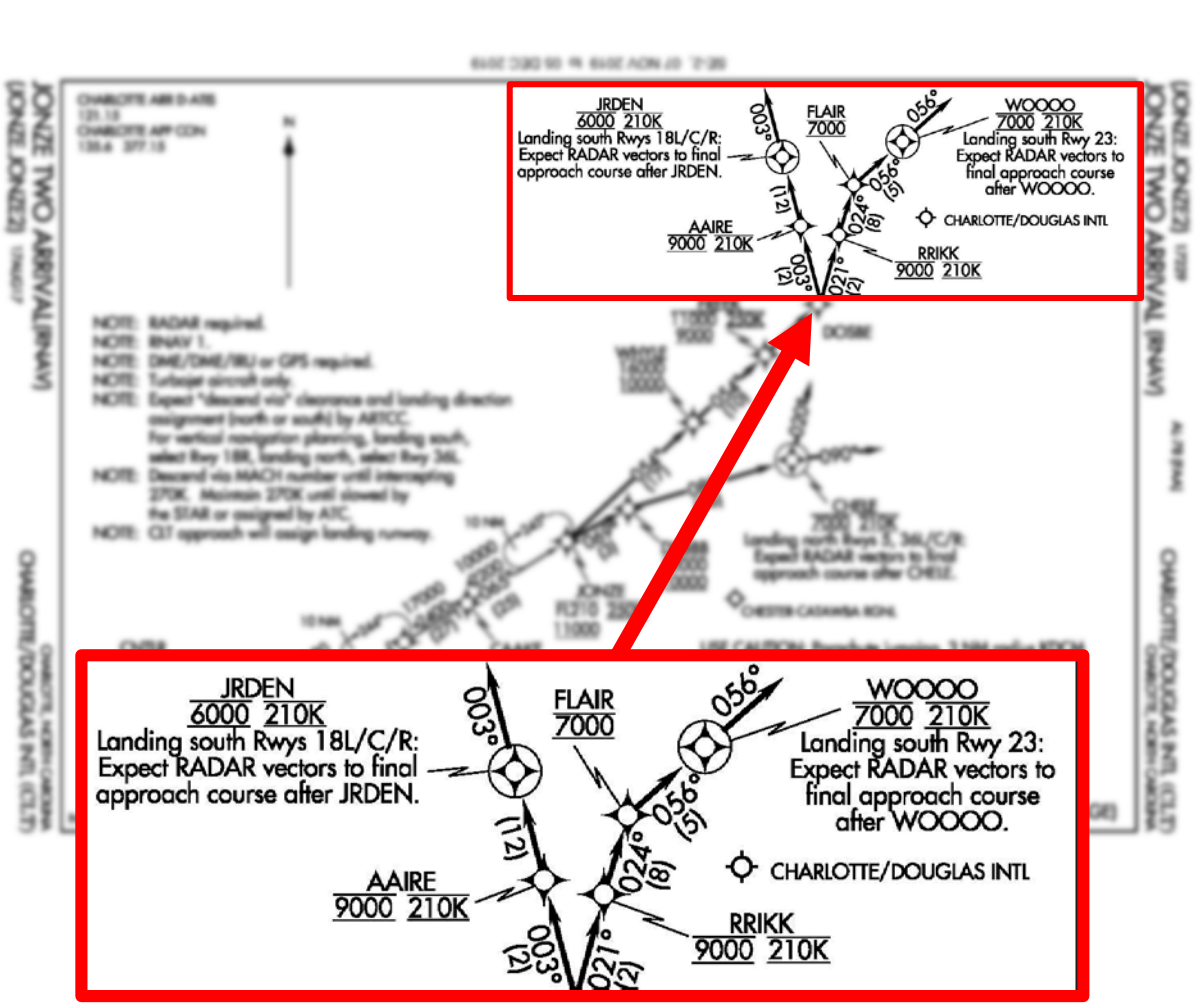


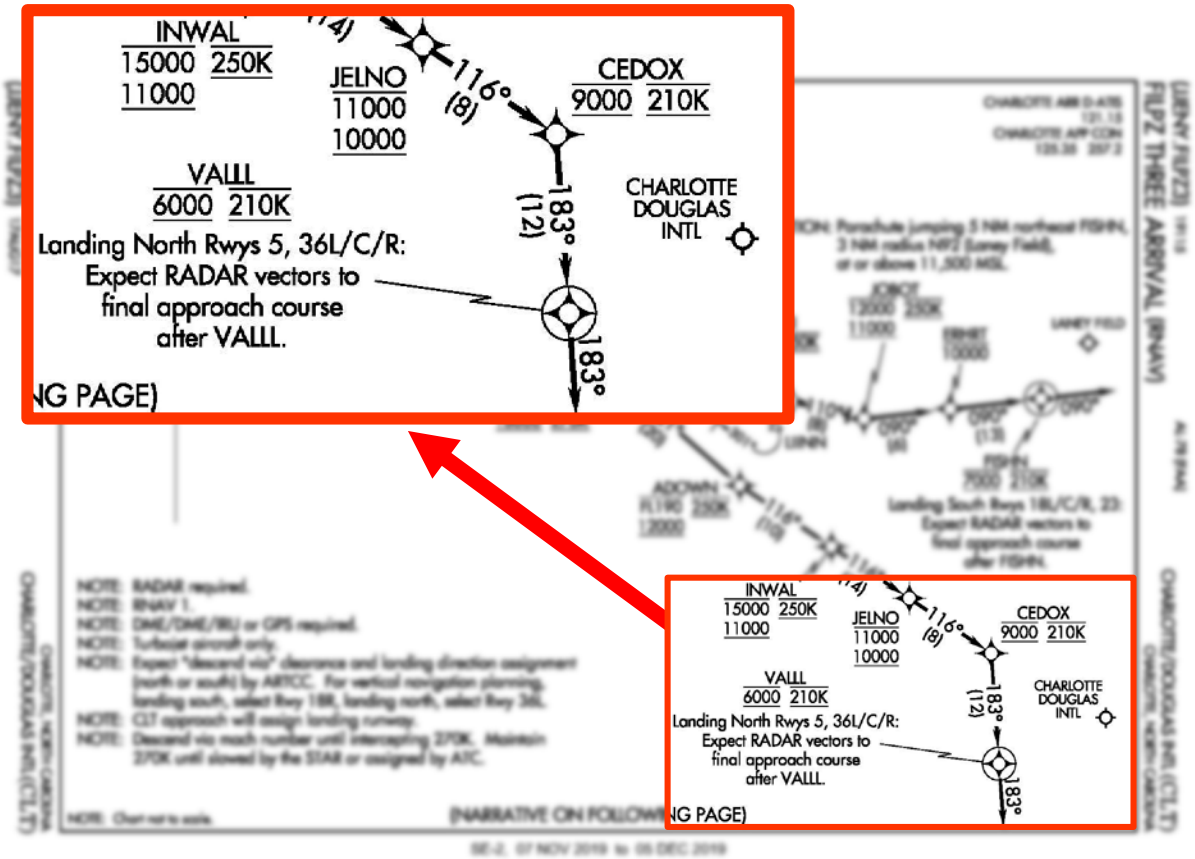
CLT Current FAA Published Arrival Procedures





CLT Current FAA Published Arrival Procedures





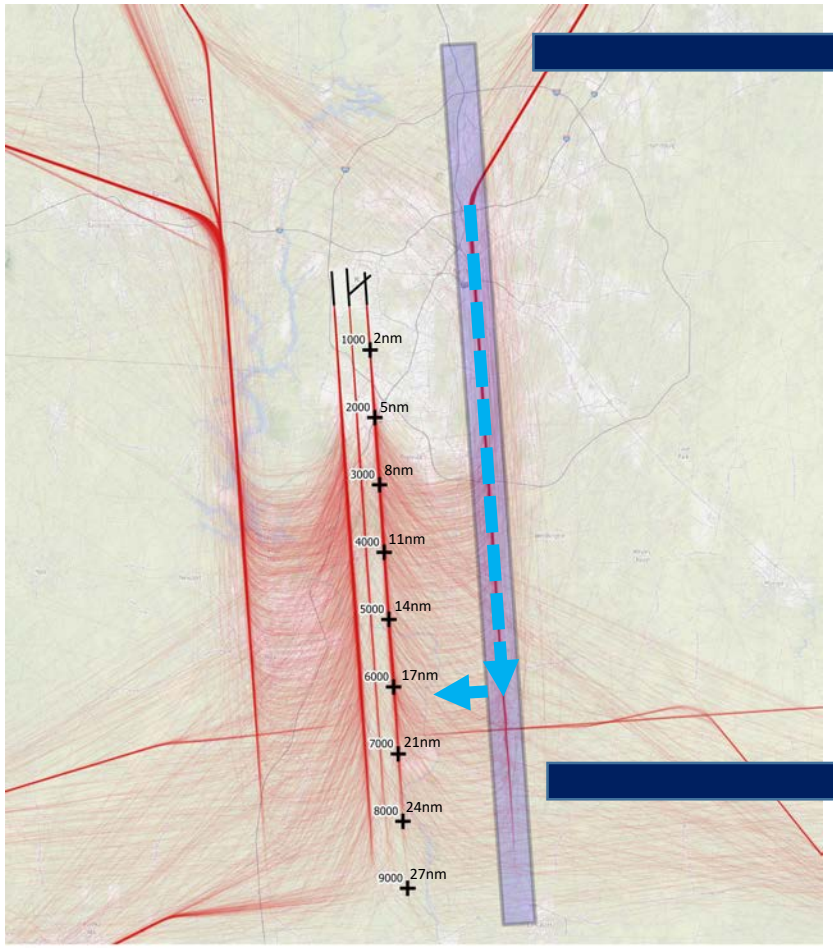
Observations:
Initial Analysis of 6,000 foot Downwinds

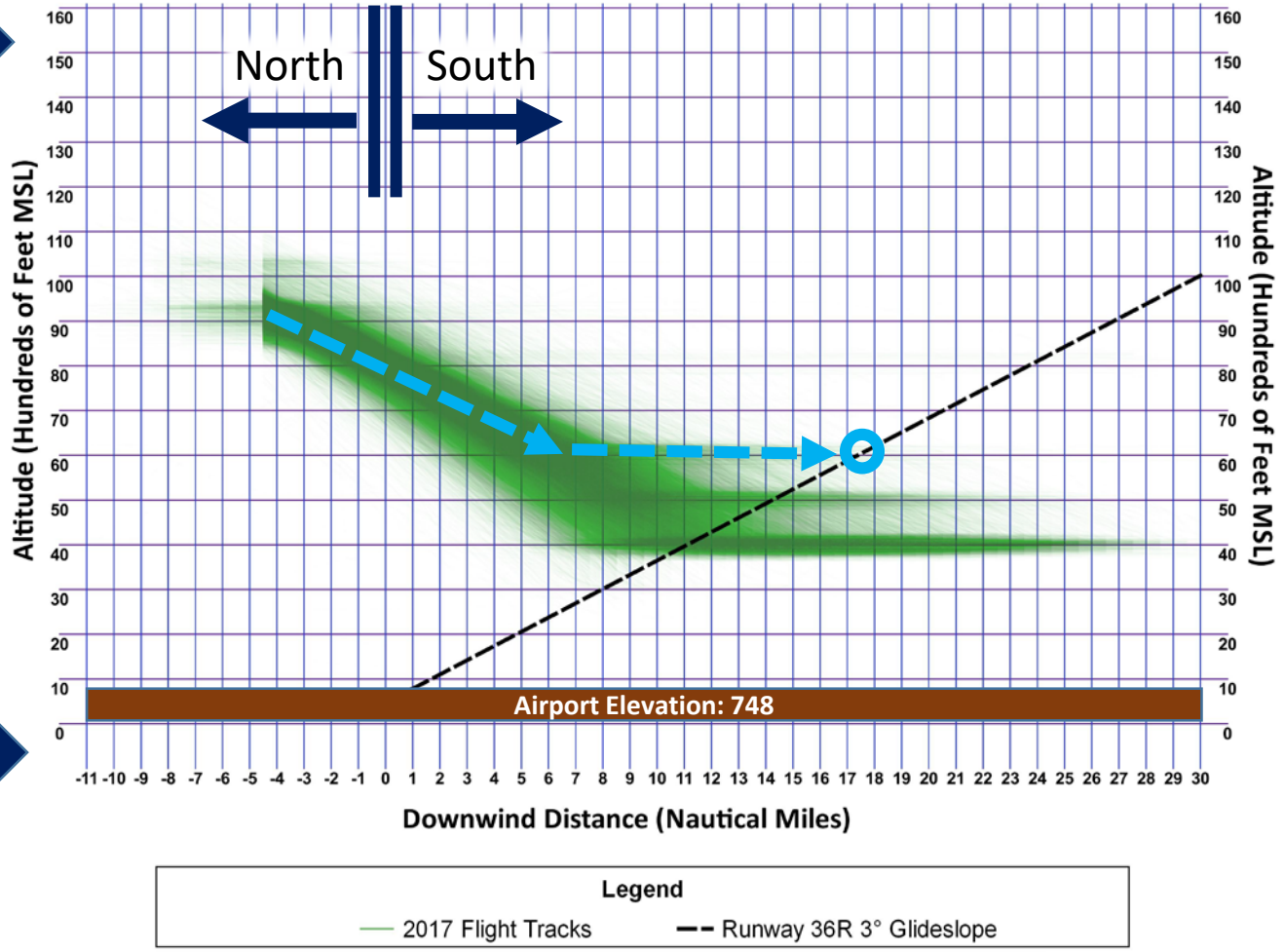
- Aircraft could be kept at 6,000 feet on the north flow east downwind, but doing so would require the aircraft to fly a greater distance from the airport on the downwind in order to intercept the 3-degree glide path for each runway
  - Aircraft are required to intercept the glideslope for Instrument Landing System Approaches (ILS) from below
  - Aircraft approaches commonly utilize a three-degree descent angle
  - An altitude of 6,000 feet on the north flow east downwind would require aircraft to fly at least 17 nautical miles south of the airport before turning off the downwind to final approach
    - Note: this 17 nautical mile distance from the airport would hold true for all four downwind flight paths due to the three-degree descent angle requirement

Observations:
Initial Analysis of 6,000 foot Downwinds

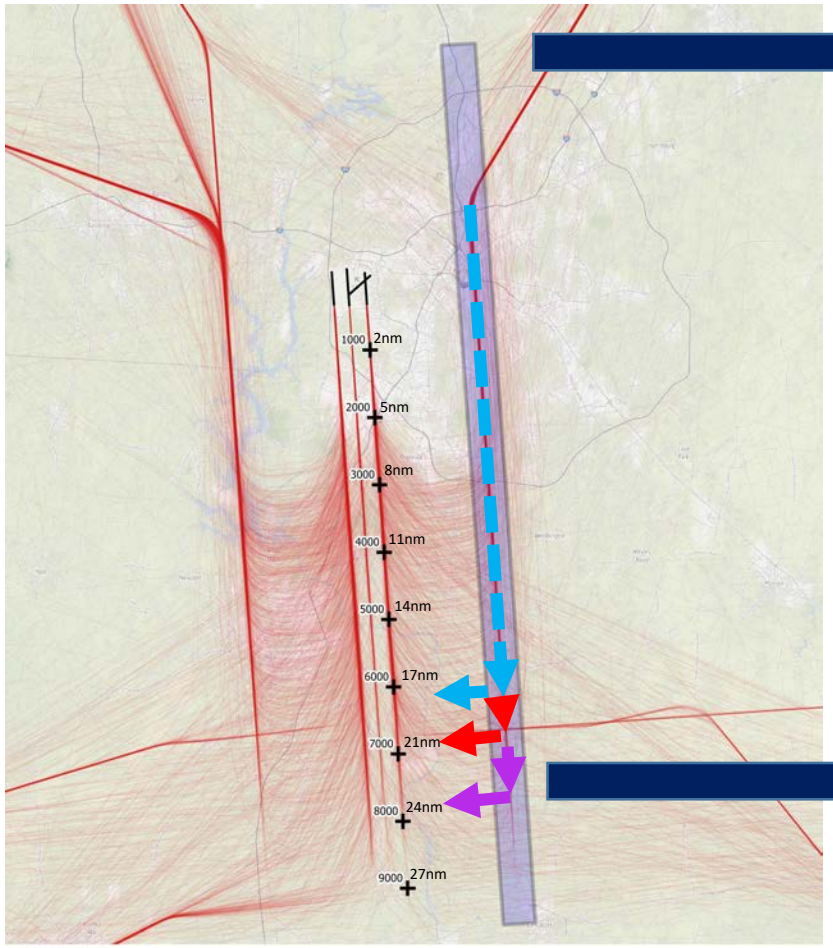
- For vertical separation requirements for the parallel runways, aircraft altitudes during the turn from the downwind flight paths would need to be adjusted
  - This would likely require turn from the downwind flight paths at altitudes of 6,000, 7,000 and 8,000 feet, dependent on assigned arrival runway, to remain at or above 6,000 feet on the downwind flight paths
  - For the north flow east downwind, this would require aircraft to fly further south:
    - 20 nautical miles south of the airport to turn off the downwind at an altitude of 7,000 feet
    - 23 nautical miles south of the airport to turn off the downwind at an altitude of 8,000 feet
- Extended downwind flight paths resulting from increased altitude would reduce airport throughput due to less flexibility for air traffic controllers to sequence aircraft in addition to creating potential conflicts with base leg arrival aircraft and containment in Class B airspace

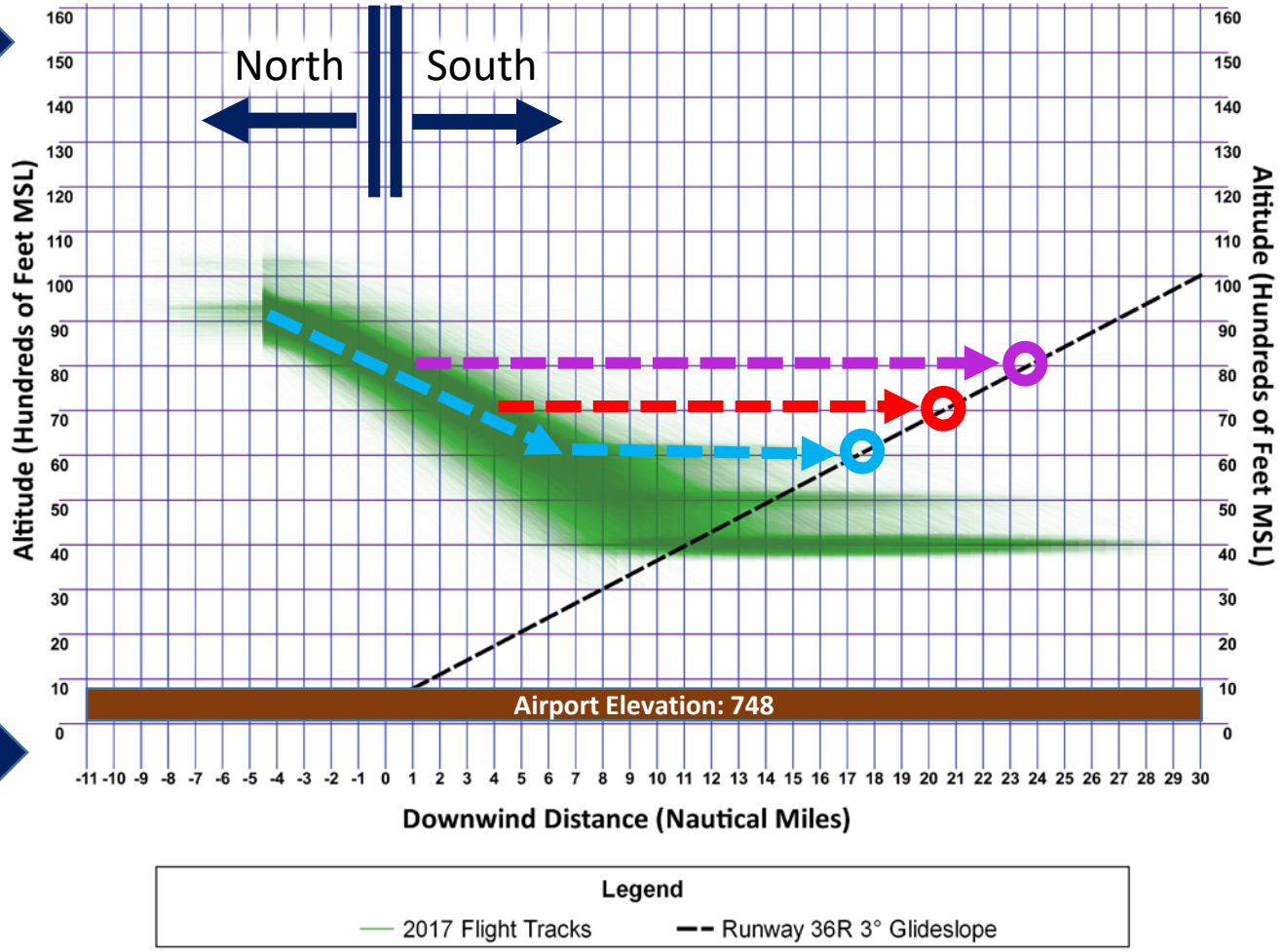
CLT North Flow East Downwind – 2017 Altitude Profiles



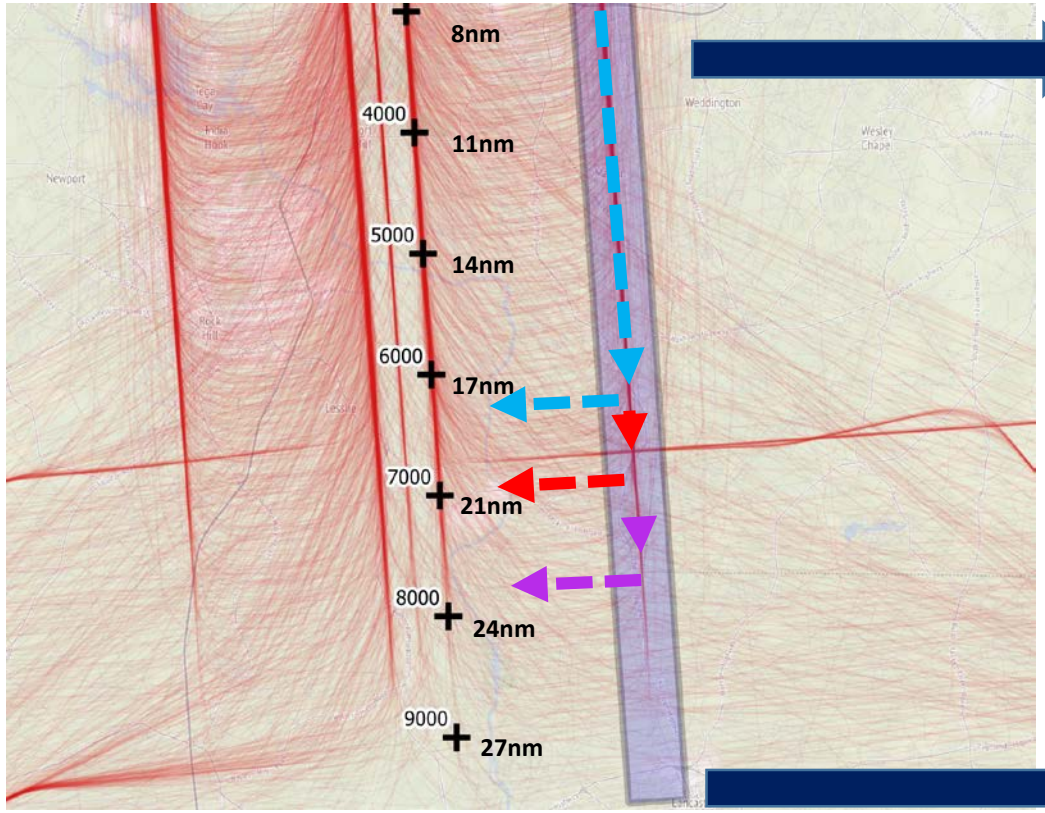


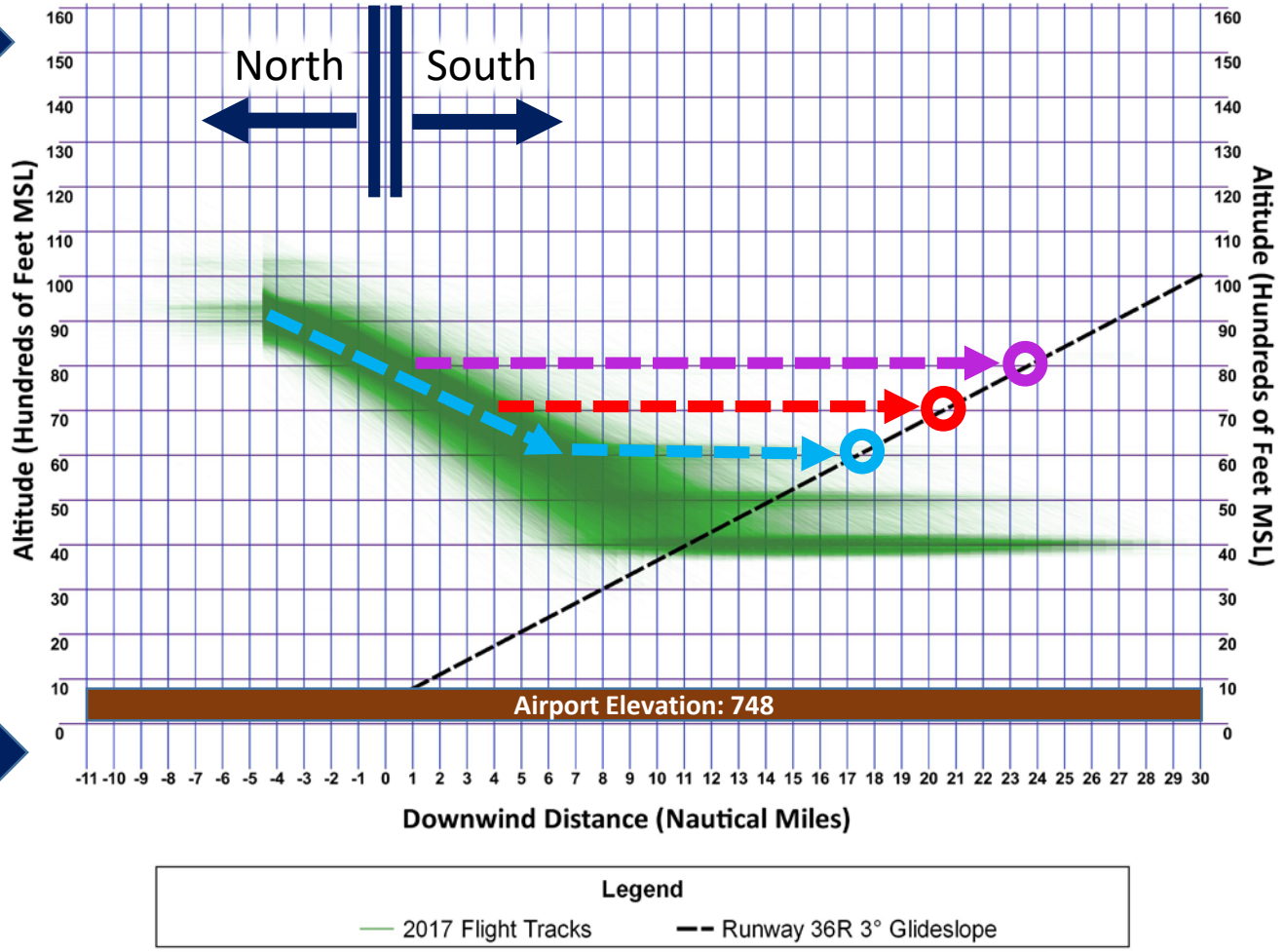
CLT North Flow East Downwind – 2017 Altitude Profiles





CLT North Flow East Downwind – 2017 Altitude Profiles





ACR Request:
Initial Analysis of 6,000 foot Downwinds Overall Analysis Considerations for the ACR

- Does the ACR want to pursue a full noise analysis of increasing/maintaining aircraft altitudes of 6,000 feet on the downwinds for inclusion in the set of ACR slate recommendations?
- Would increasing the time aircraft spend on the downwind, length of the downwind leg, and a shifting of aircraft operations meet the goals of the ACR?
- How does the potential negative effect on airport throughput of having aircraft remain at 6,000 feet or higher on the downwinds factor in to the ACR recommendations?