

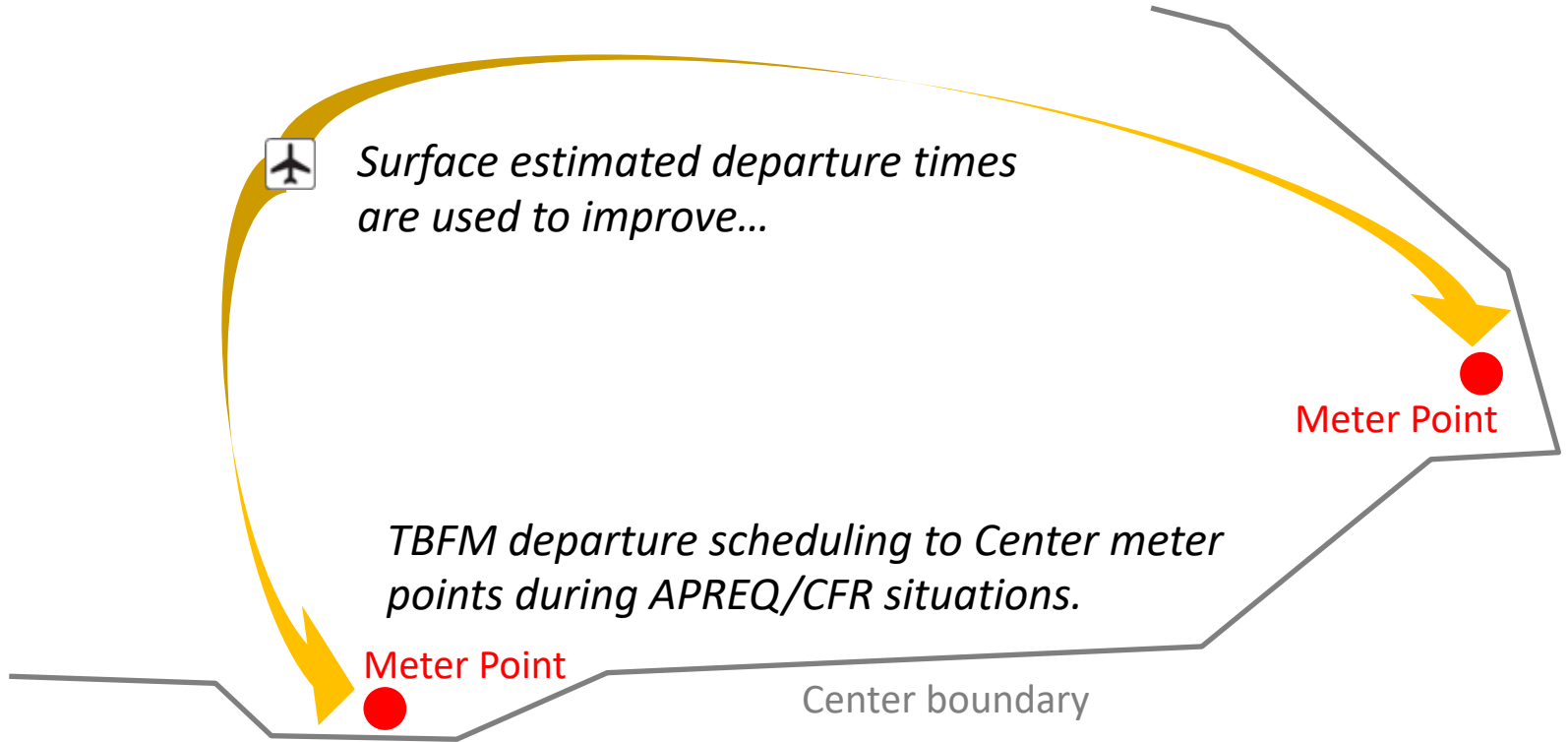
# Departure Approval Request Compliance Effects on Overhead Stream Insertion

Todd Callantine

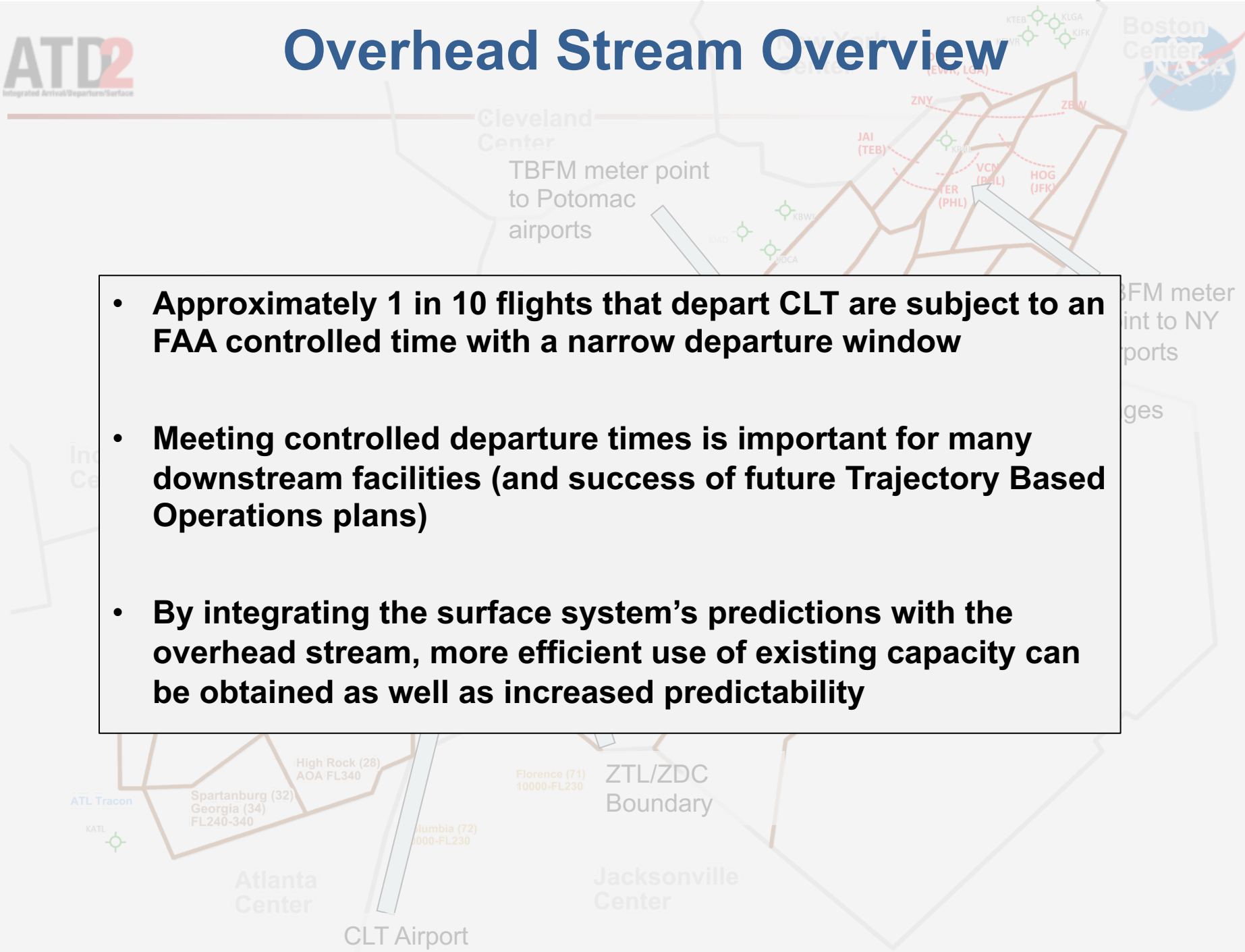
Jeremy Coupe

Bob Staudenmeier

5 September 2019



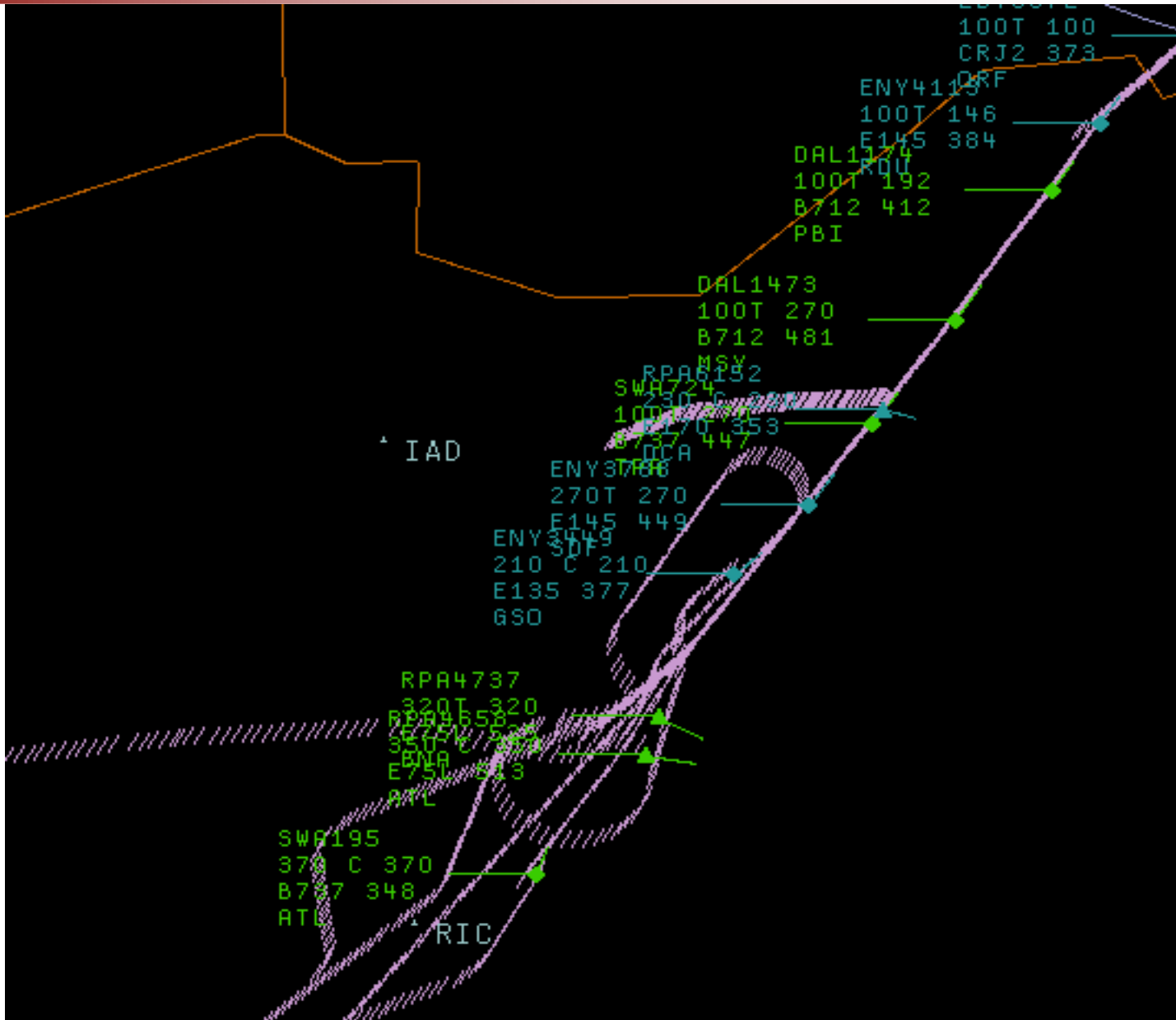
# Overhead Stream Overview

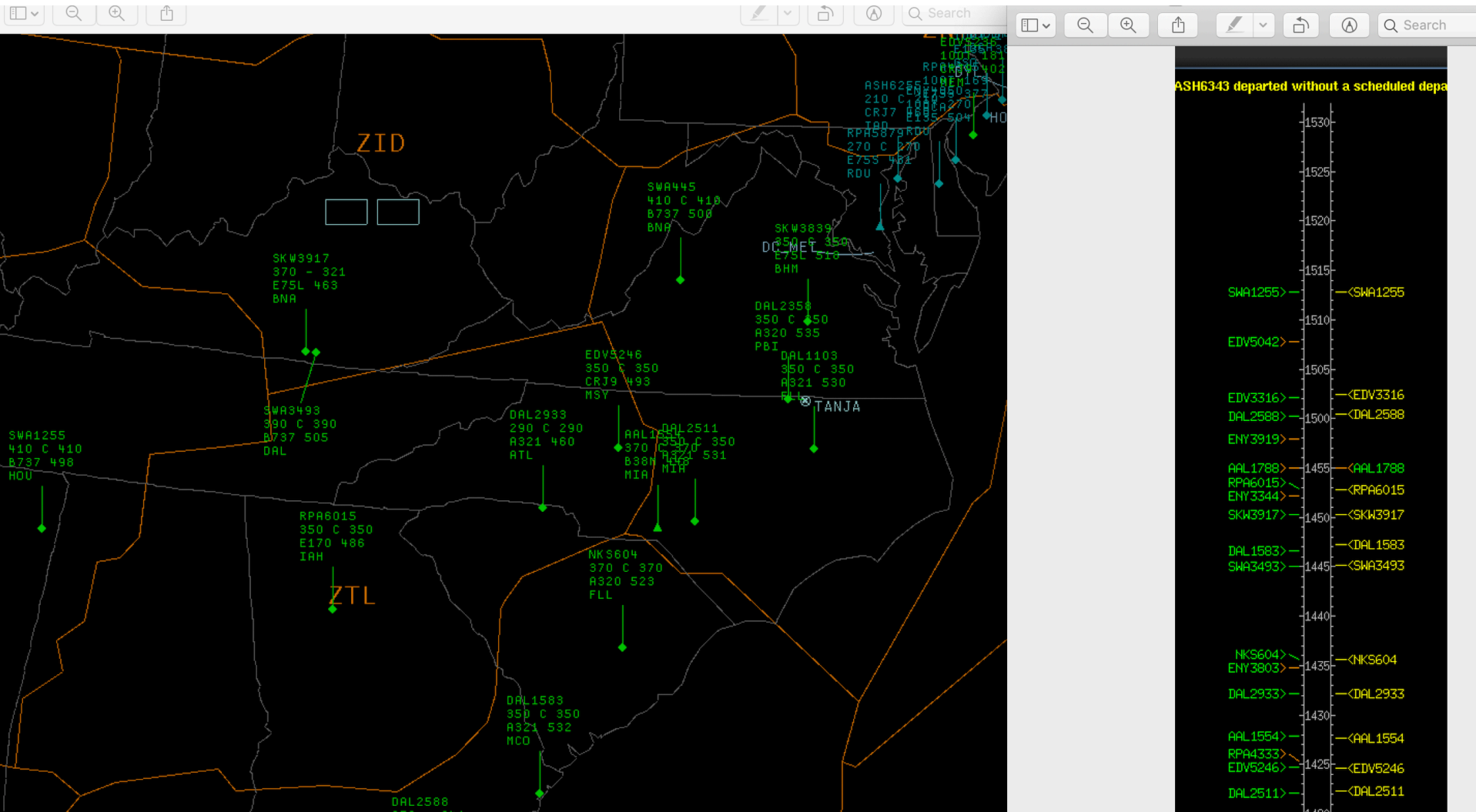


- **Approximately 1 in 10 flights that depart CLT are subject to an FAA controlled time with a narrow departure window**
- **Meeting controlled departure times is important for many downstream facilities (and success of future Trajectory Based Operations plans)**
- **By integrating the surface system's predictions with the overhead stream, more efficient use of existing capacity can be obtained as well as increased predictability**



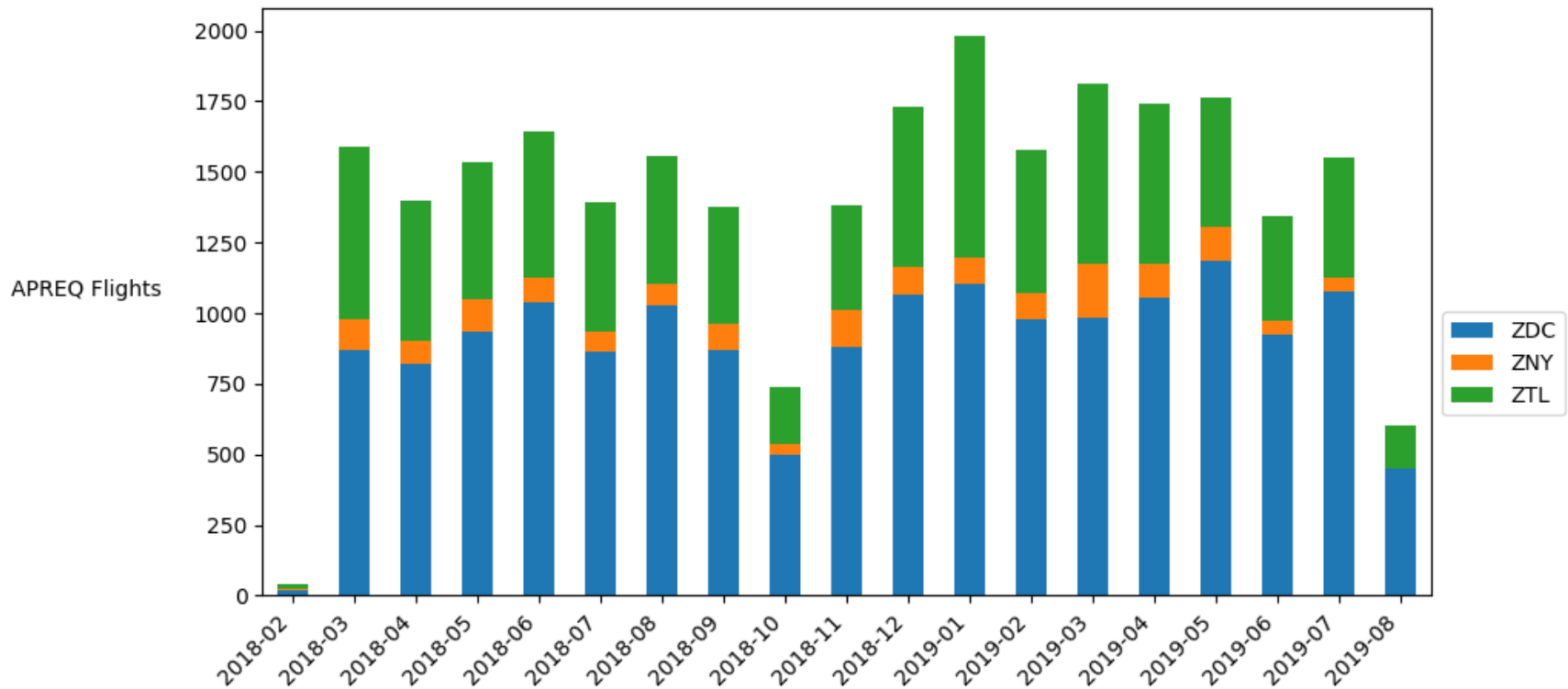
# Vectoring to Merge Flows



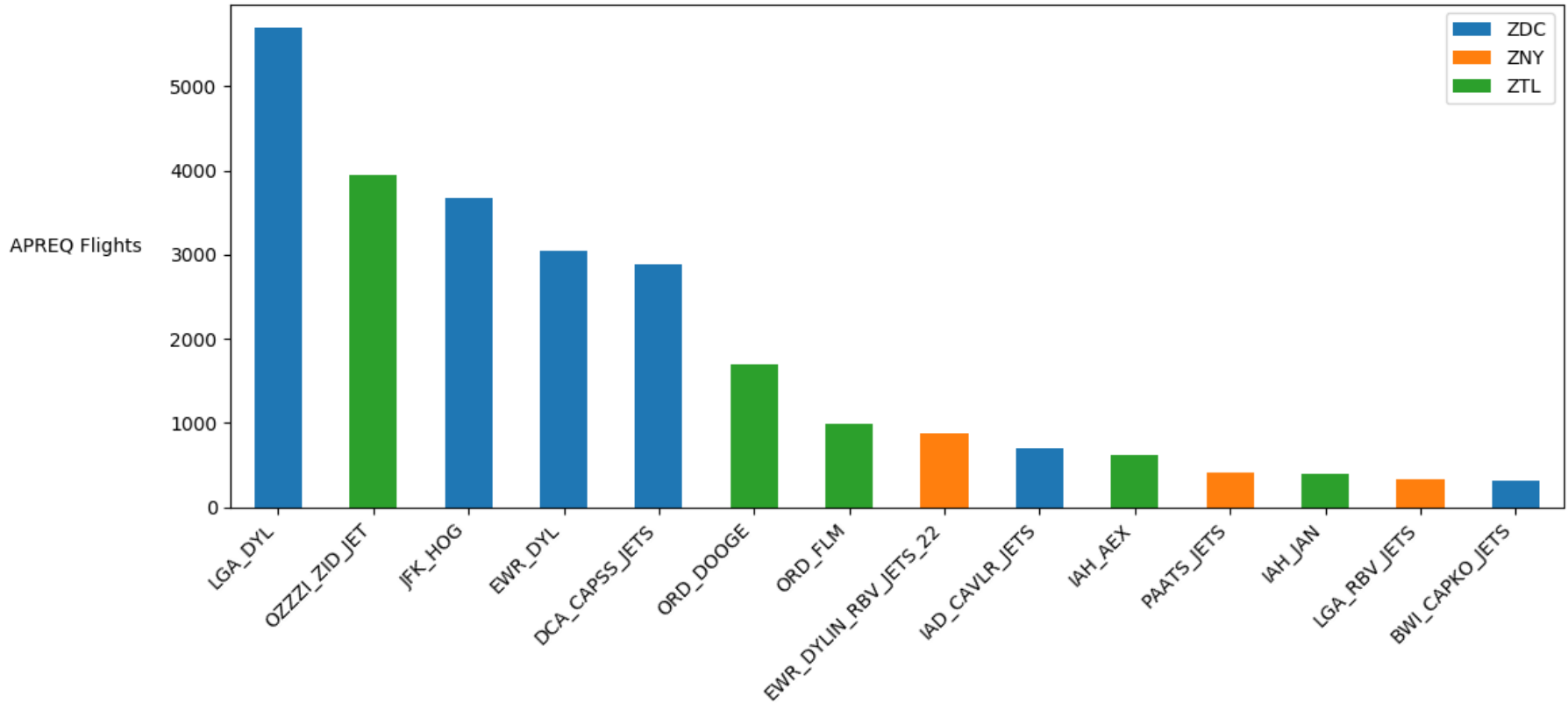


- TBFM schedule data merged with flight\_summary data
  - CLT APREQs with TBFM schedule data and departure\_runway\_actual\_time

26,752 Flights

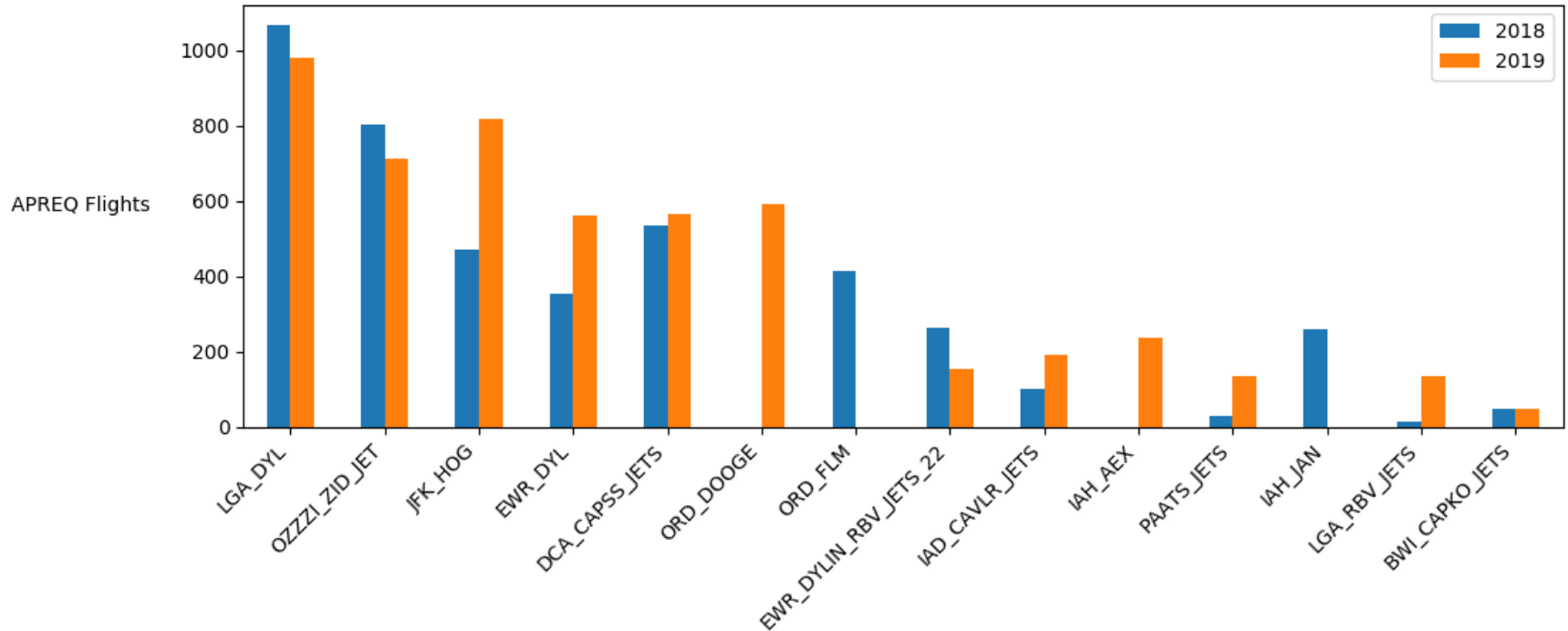


Most utilized:



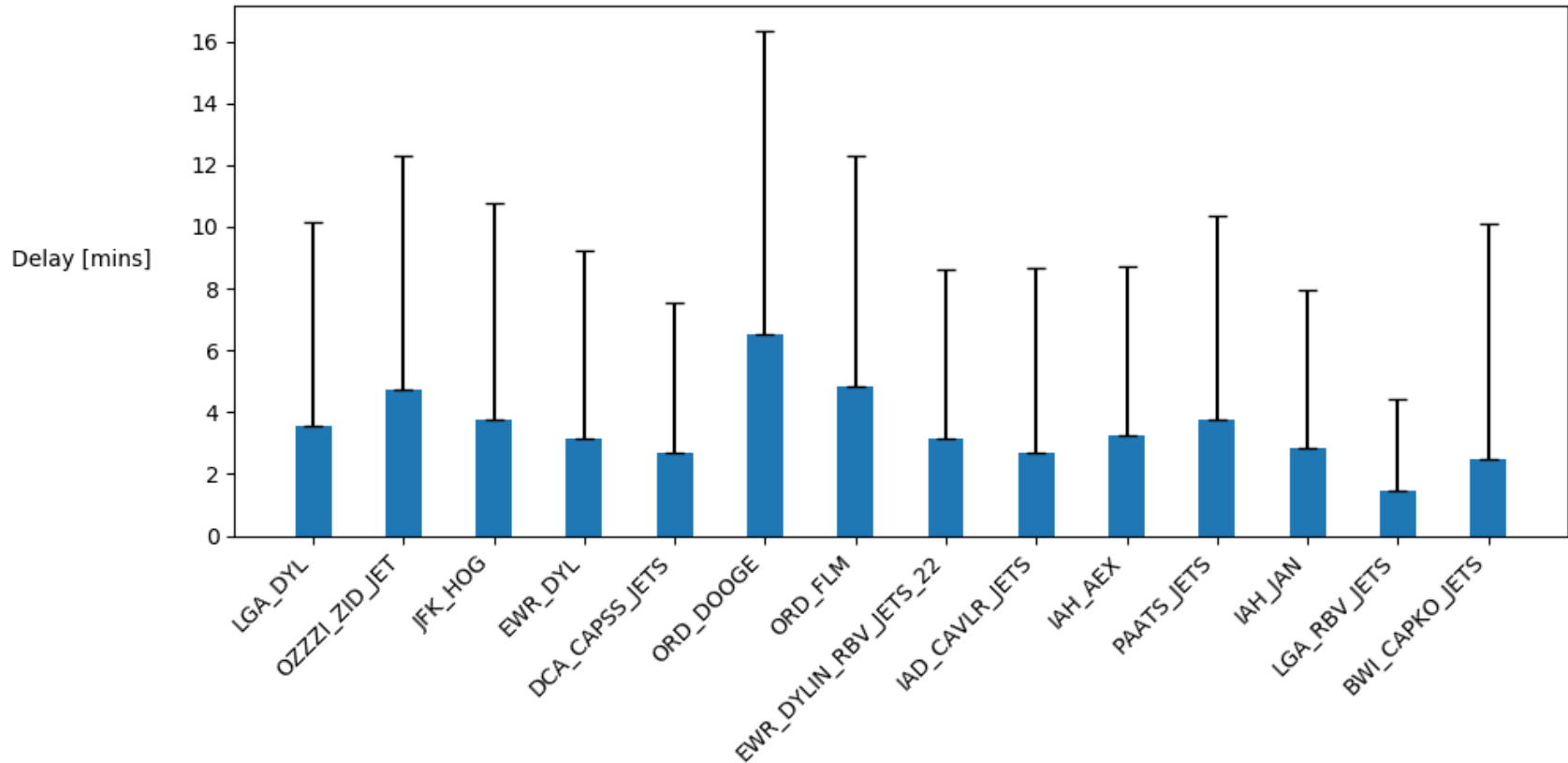


Year-over-year stream-class utilization changes:



CLT Apreqs: Mar-May 2018 vs. Mar-May 2019

Average delay by stream class for CLT Areqs:



Error bars: 1 std. dev.



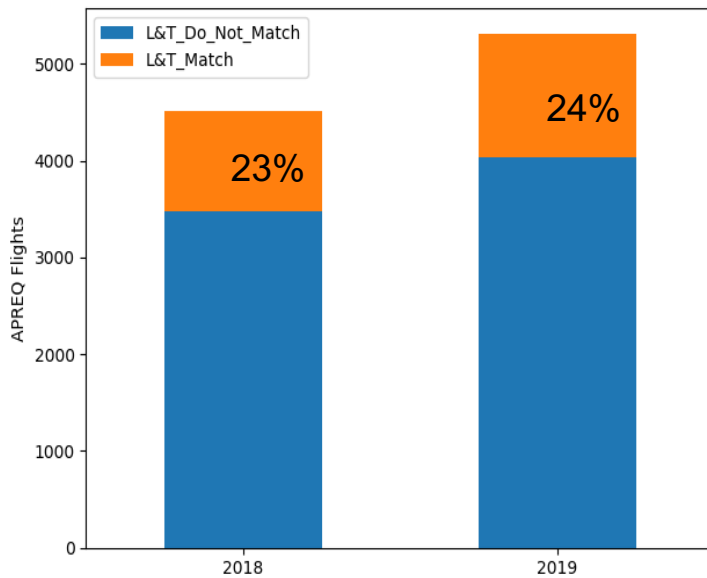
- Lead & Trail Match

Lead and trail upon departure scheduling match lead and trail upon schedule-point crossing

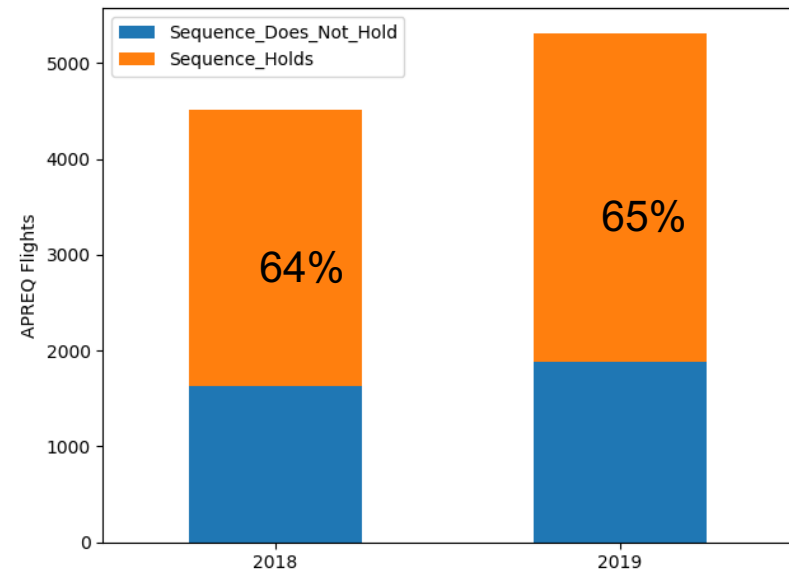
- Sequence Holds

Upon schedule-point crossing, lead at departure scheduling is still ahead and trail at departure scheduling is still behind (other aircraft may have merged)

## Lead & Trail Match

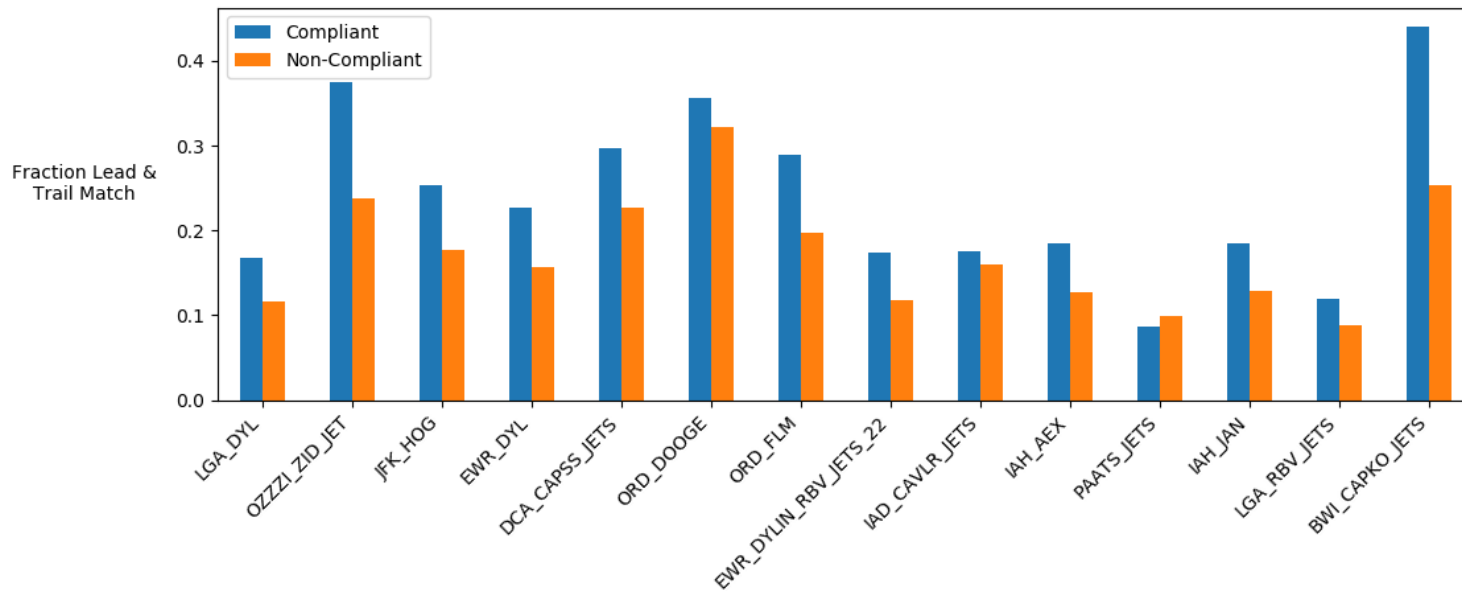
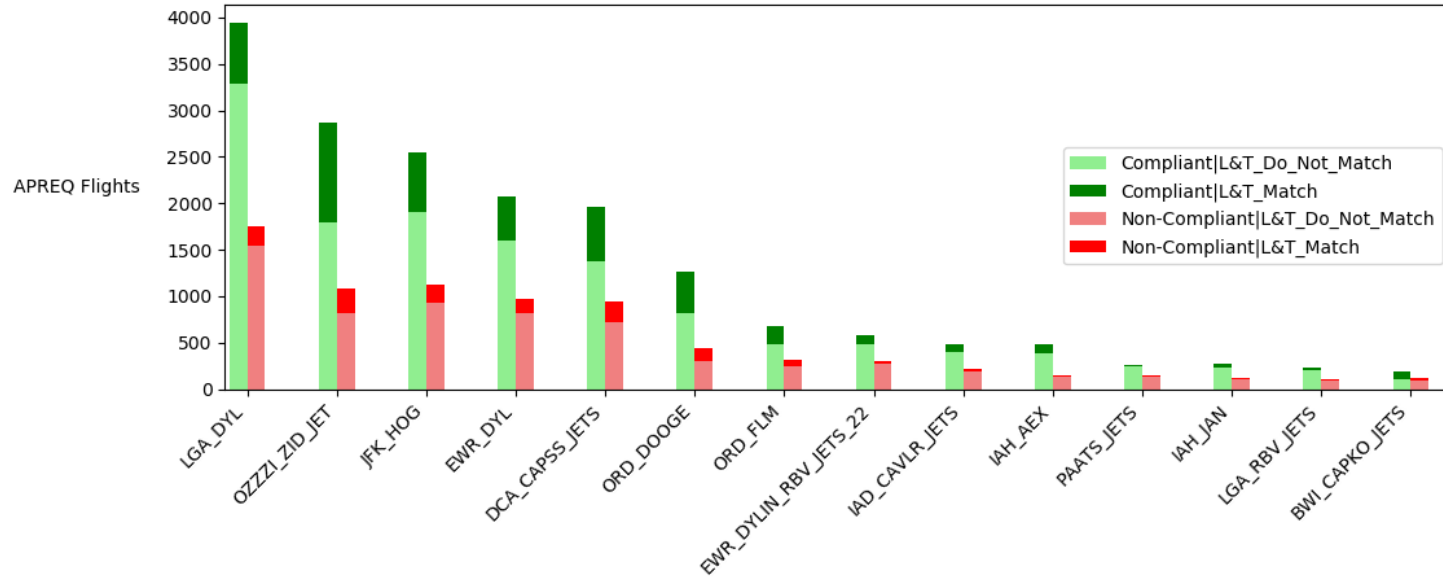


## Sequence Holds

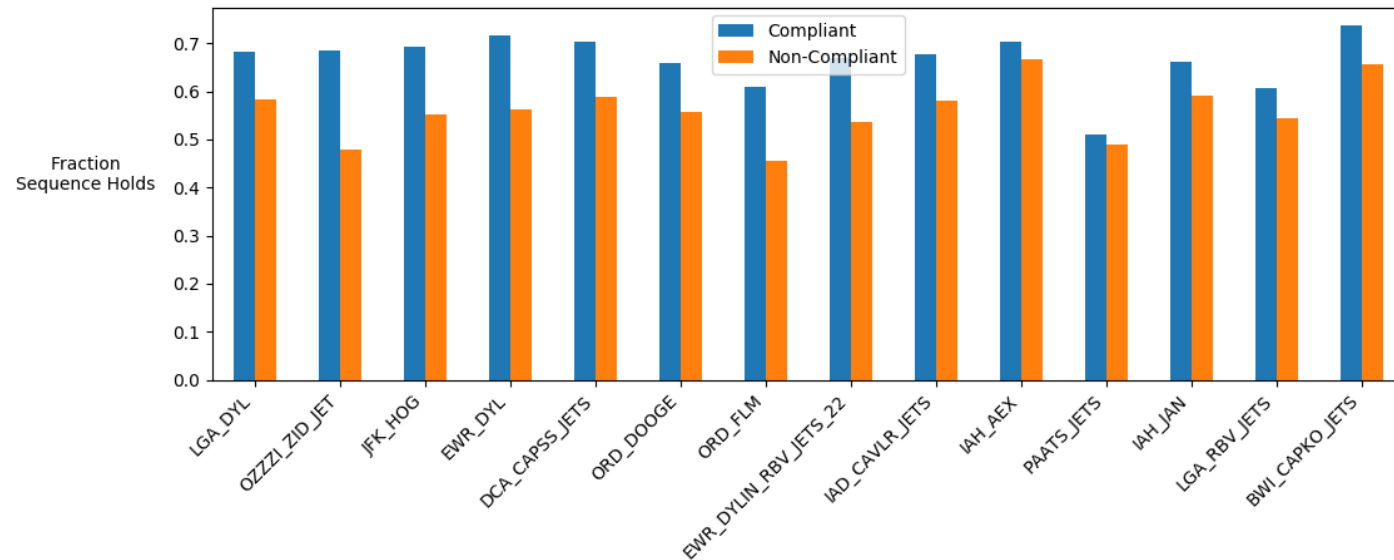
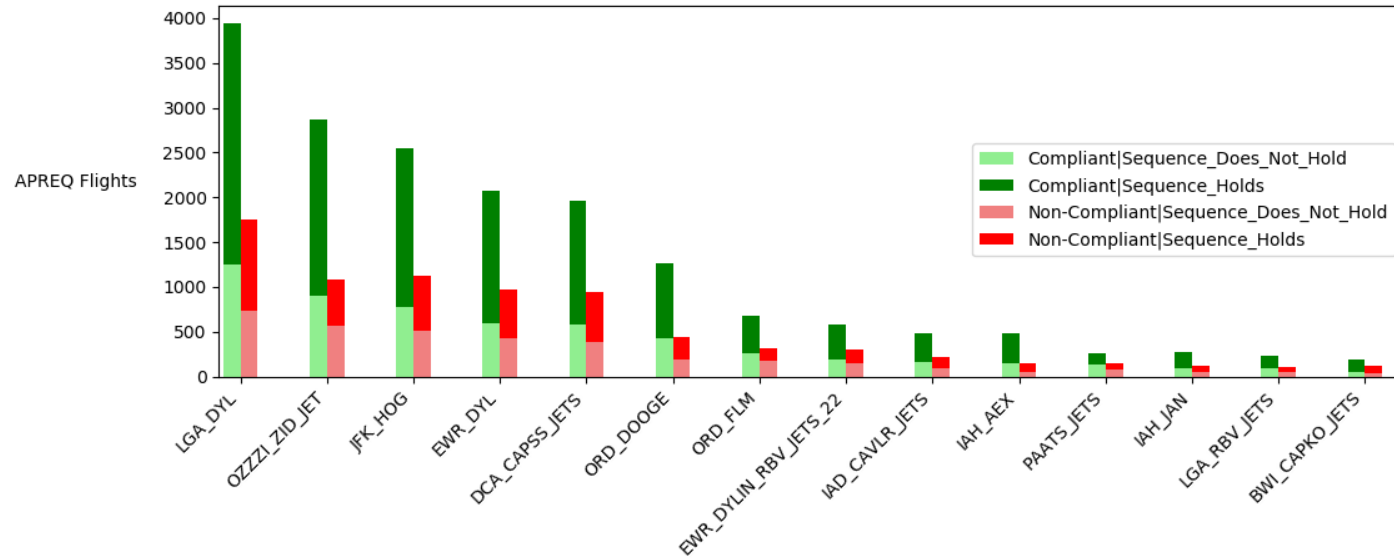


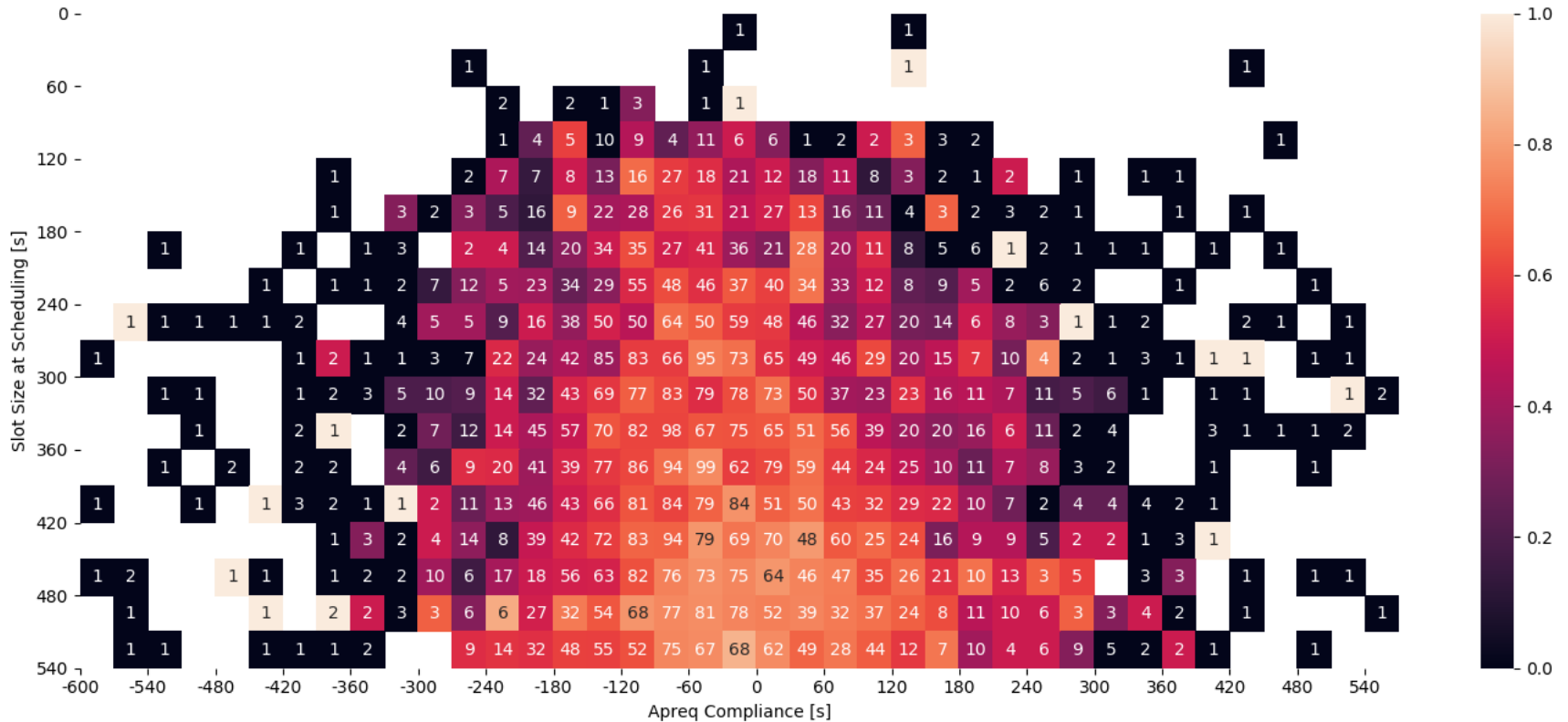
CLT Apreqs: Mar-May 2018 vs. Mar-May 2019

# 'Lead & Trail Match' by Stream Class

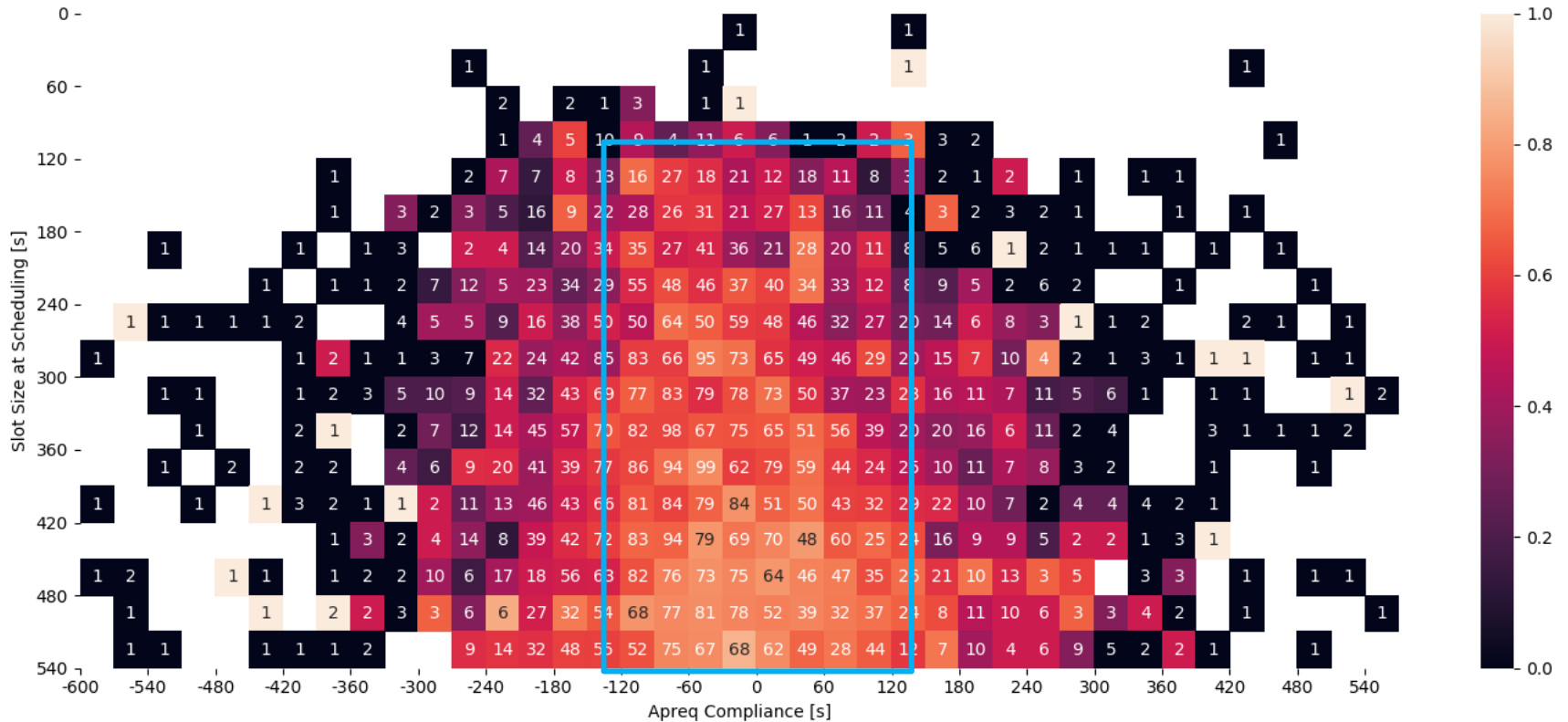


# 'Sequence Holds' by Stream Class





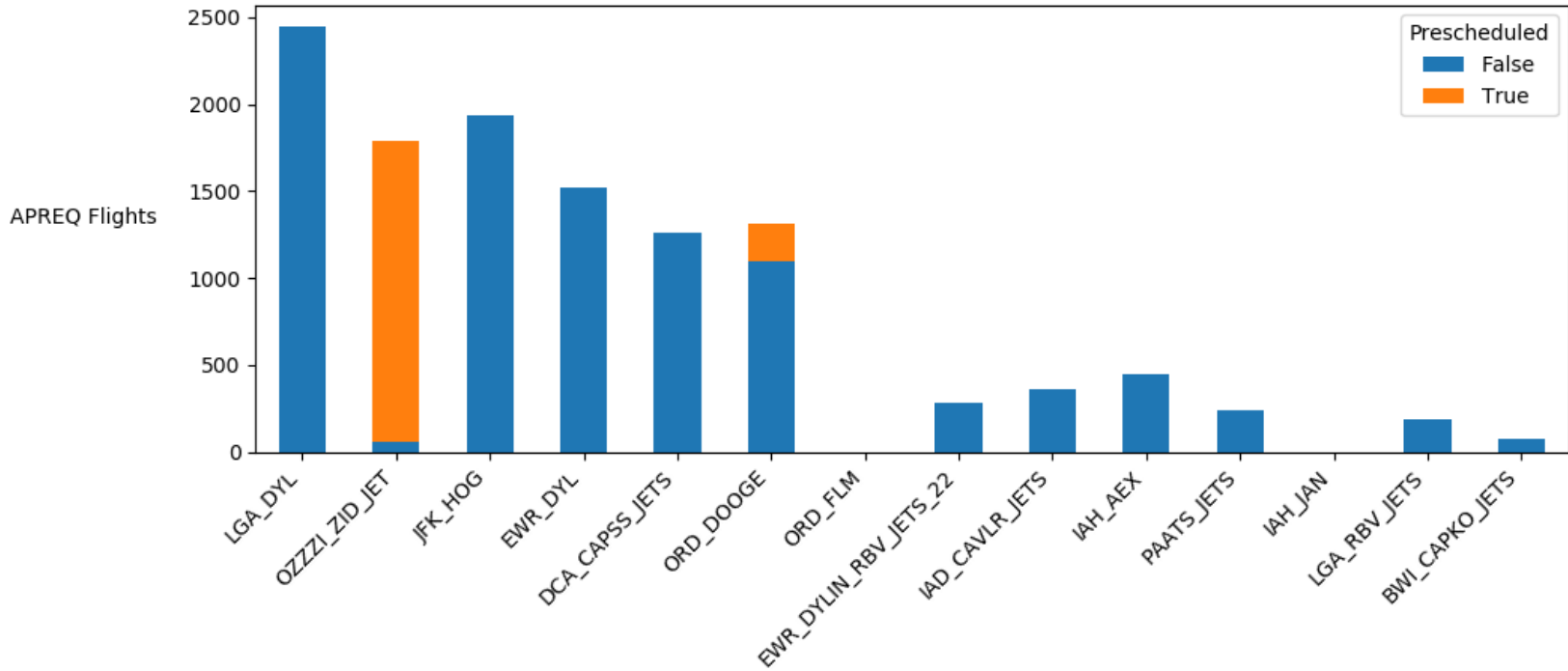
- Top stream classes
- Colors show fraction for which sequence holds
- Numbers show sample size (23,735 CLT Apreqs)



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- Colors show fraction for which sequence holds
- Numbers show sample size (23,735 CLT Apreqs)



Stream classes with prescheduling:

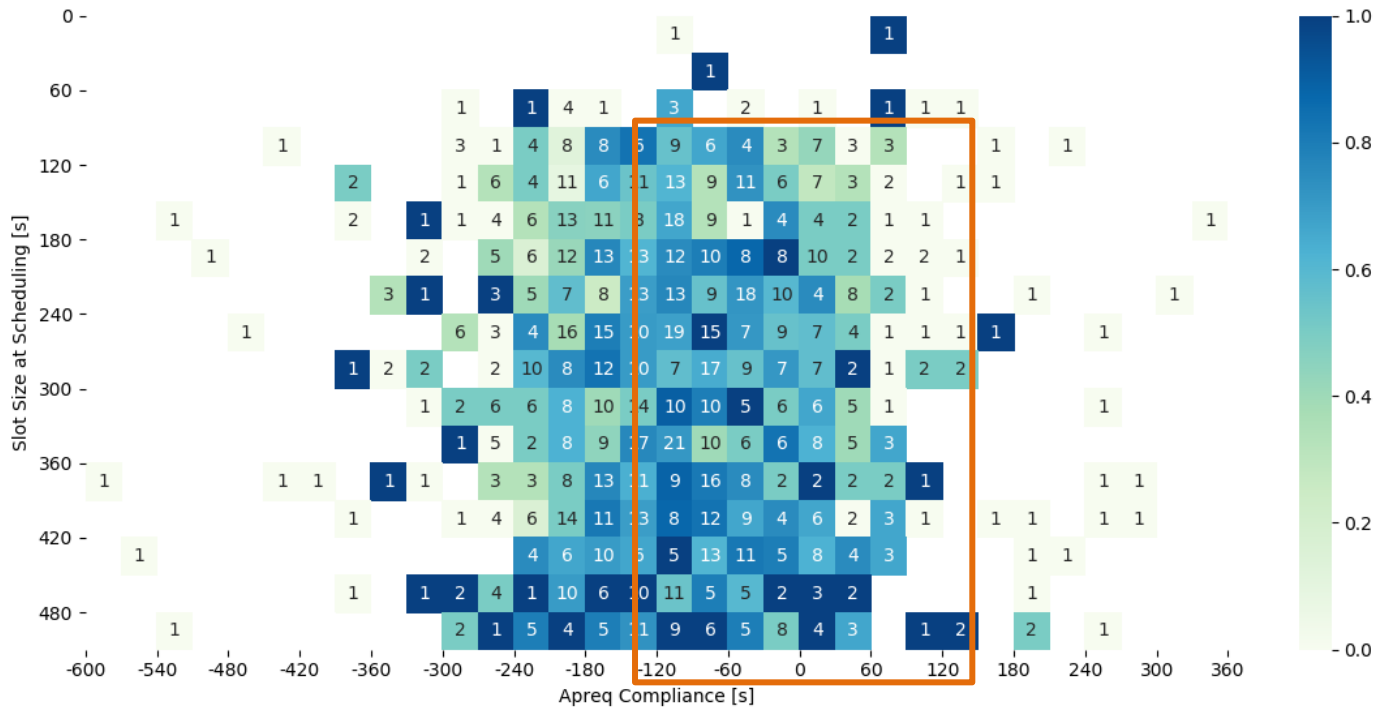


2019 CLT Apreqs

	Compliance	Lead & Trail Match	Sequence Holds
Prescheduled	75%	34%	63%
Not Prescheduled	69%	22%	63%

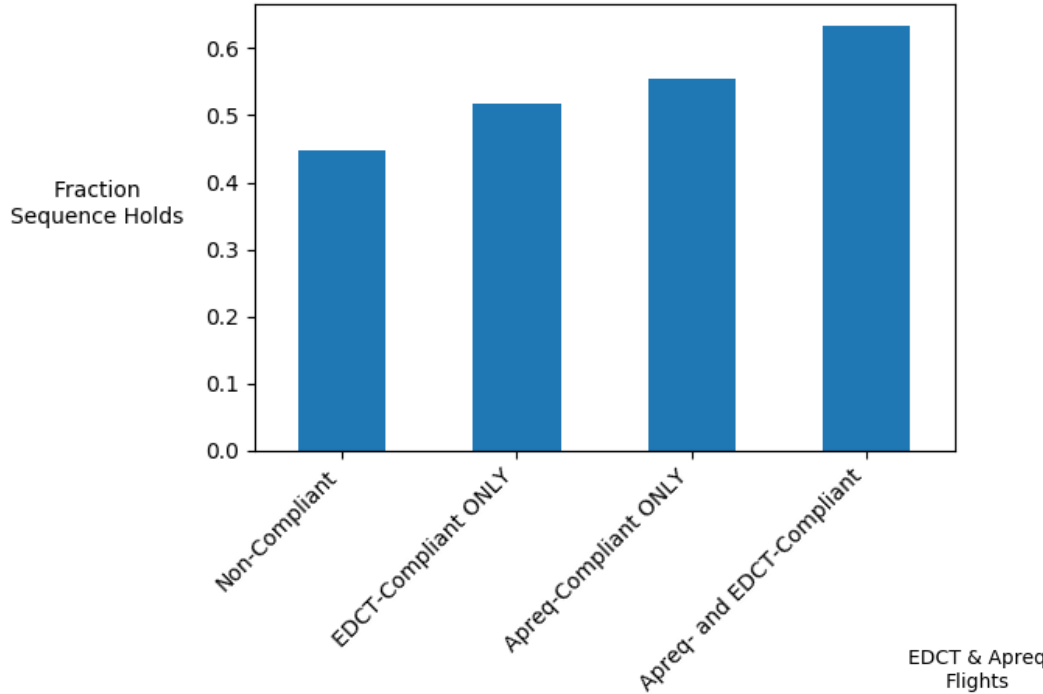
- 2,428 *prescheduled* CLT Apreq flights

- Prescheduled flights



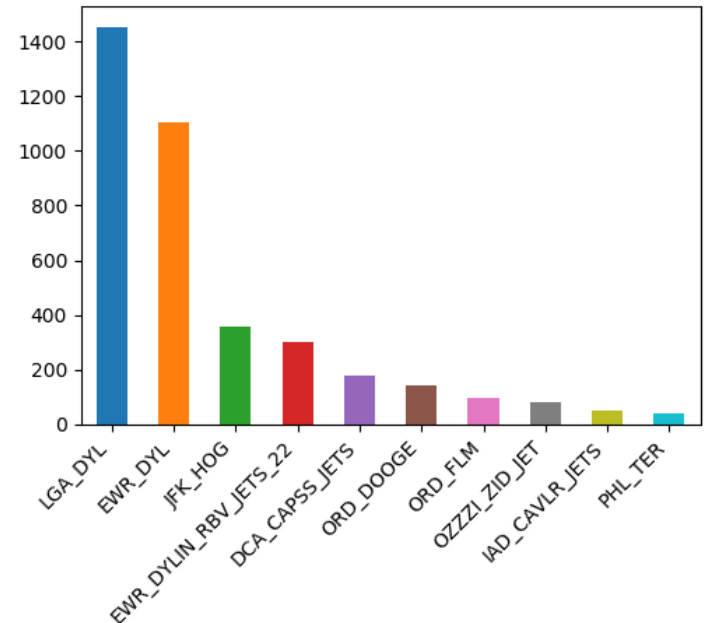
- Colors show fraction of sequence-hold's
- Numbers show sample size (2,297 *prescheduled* CLT Apreqs)

# 'Sequence Holds' by Apreq and EDCT Compliance



- 4,061CLT Apreq flights with EDCTs

EDCT Stream Classes





- Stream-class specific analysis combines TBFM and surface data
- Areq compliance consistently improves stream insertion
  - Variation with slot size
  - Variation with stream class and specific flow characteristics
- ‘Sequence Holds’ insensitive to prescheduling (also insensitive to airport configuration)