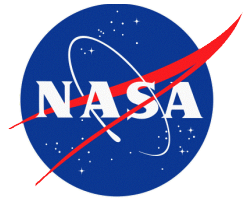
SAN JOSÉ STATE UNIVERSITY

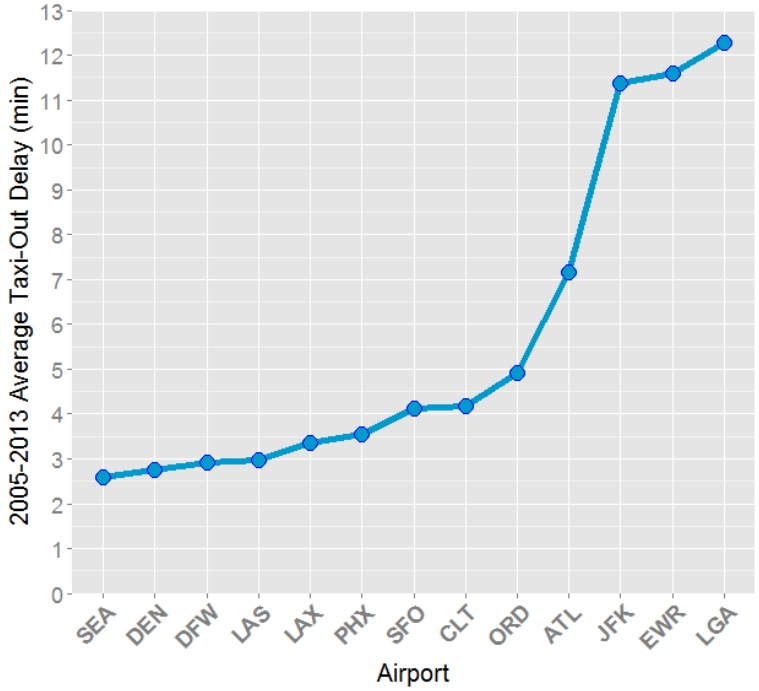


Tool-enabled changes in terminal air traffic controller task and workload distribution

Jeffrey Homola, Paul Lee, Nancy Smith,
Eric Chevalley, Bonny Parke, & Hyo-Sang Yoo

AHFE 2015 Las Vegas, NV

Background

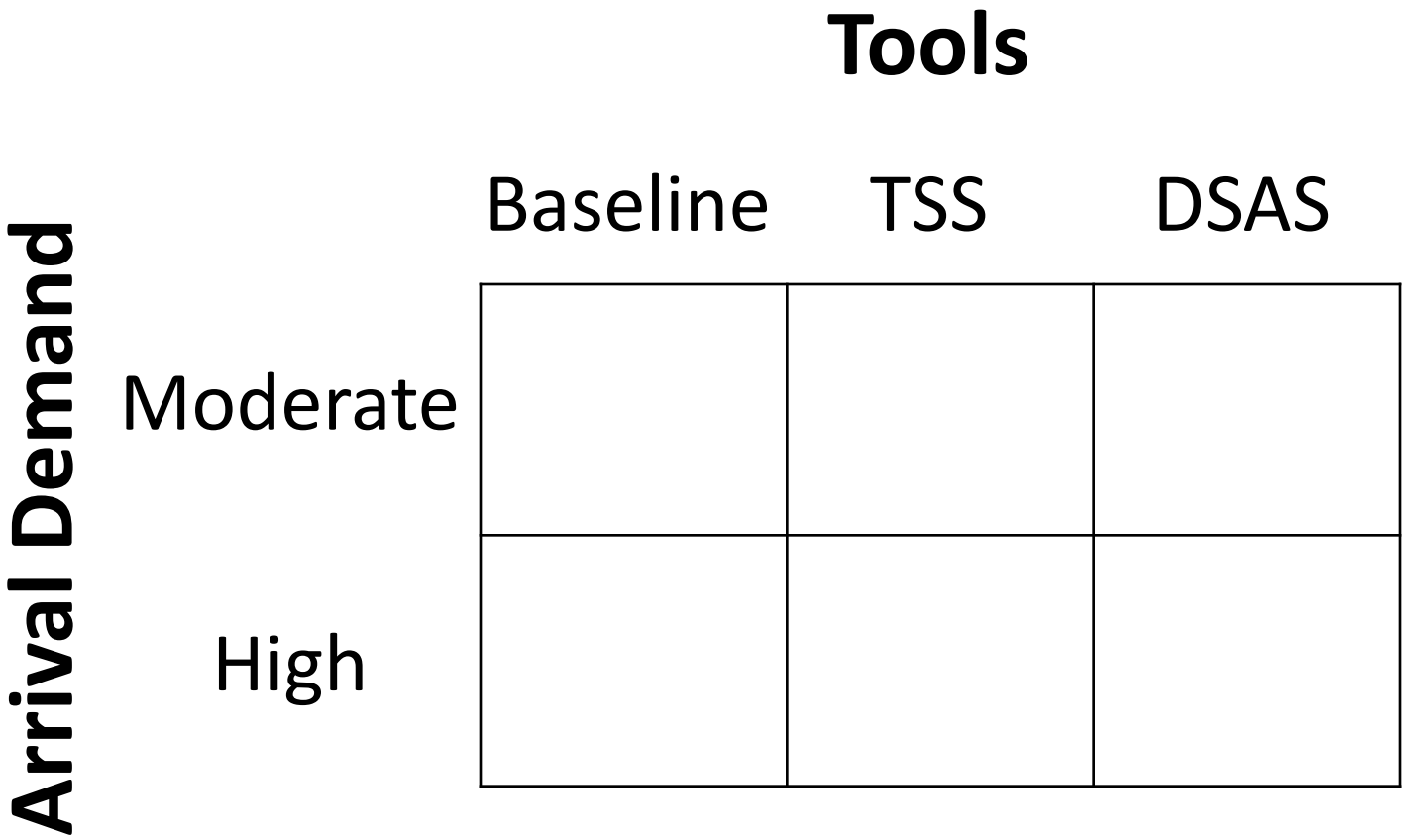


Complexity, delay, and congestion in New York

Introduction

- A human-in-the-loop simulation was conducted that examined an approach to adjusting the flow of arrivals into LGA to enable higher departure throughput while maintaining arrival throughput.
- This approach, referred to as Departure-Sensitive Arrival Spacing (DSAS), leverages the capabilities of the Terminal Sequencing and Spacing (TSS) system with an additional Decision Support Tool (DST) to assign more precise arrival spacing intervals to allow for one or more departures out between successive arrivals.
- Reported by Paul Lee at ATM 2015: *Reducing Departure Delays at LaGuardia Airport with Departure-Sensitive Arrival Spacing (DSAS) Operations*

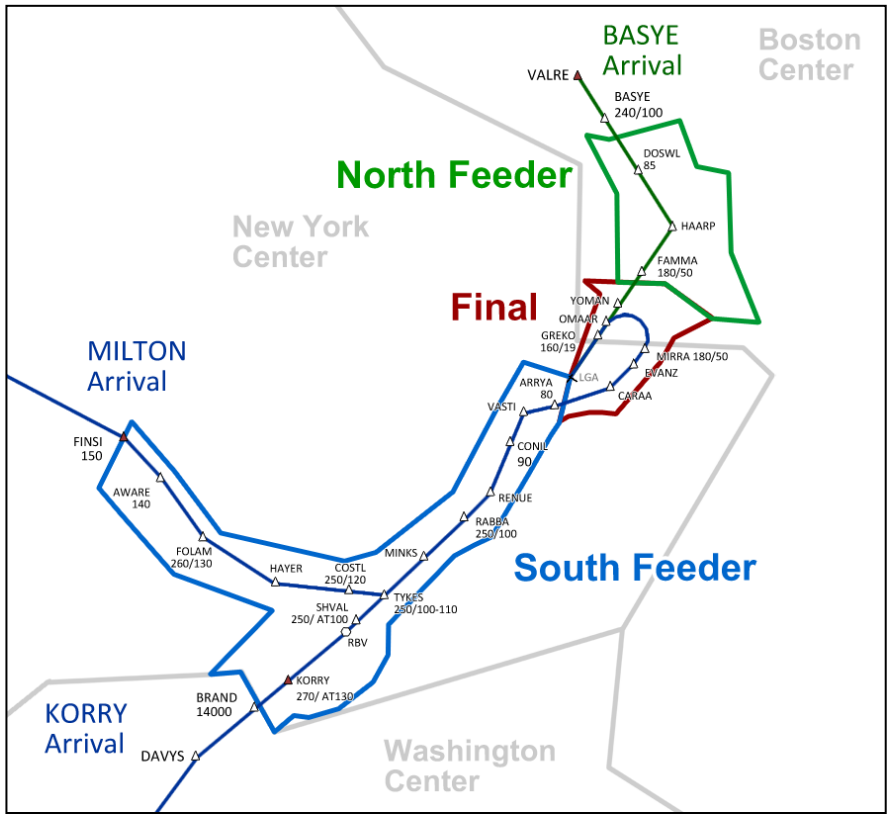
Experiment Design

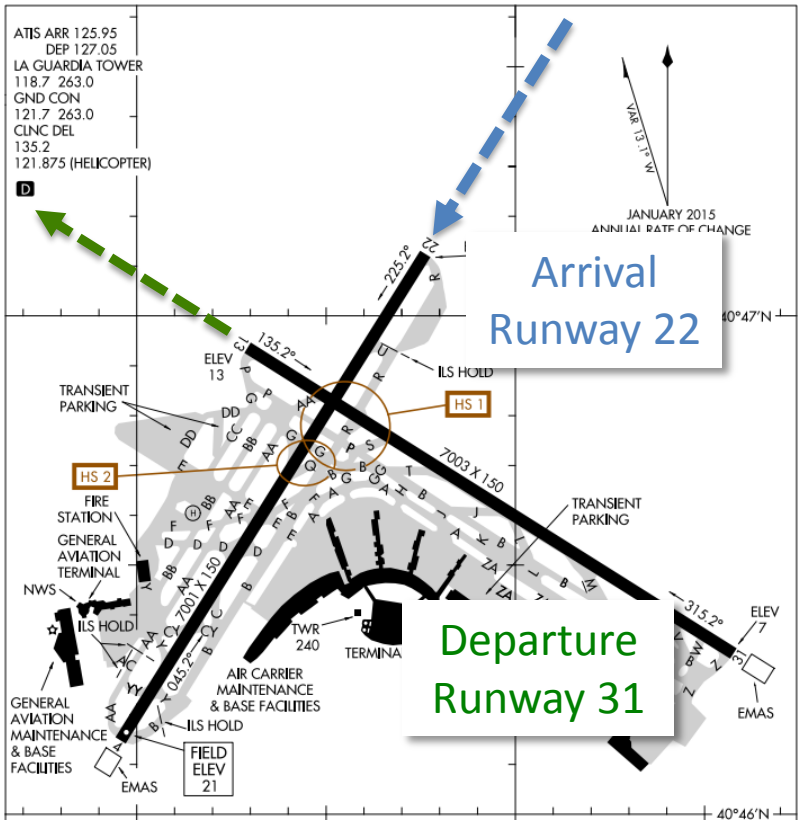


Objective

- Examine the way in which the distribution of tasks and control strategies used changed across tool conditions
- Assess the resulting impact of the changes on controller workload

Airspace and Runway Configuration

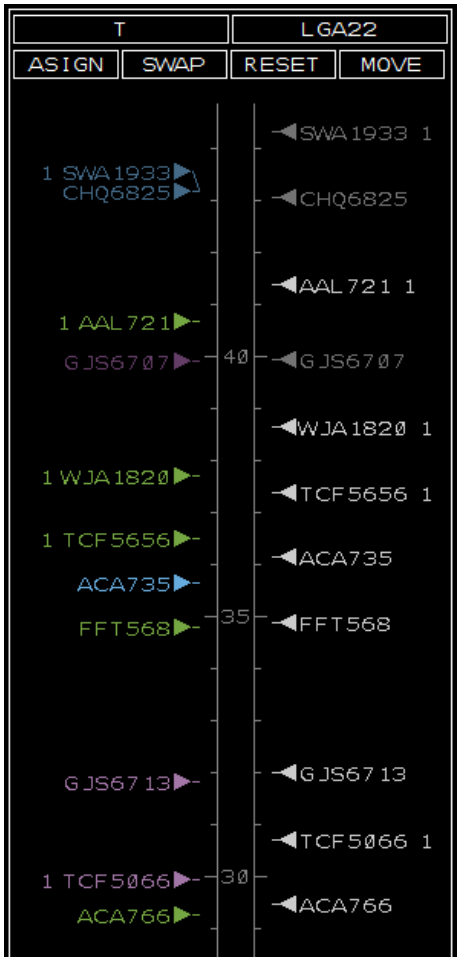




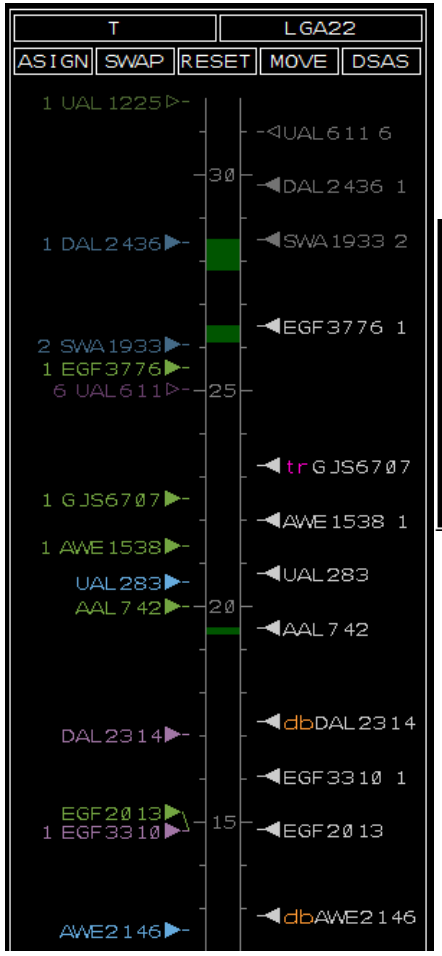
DST: Timeline

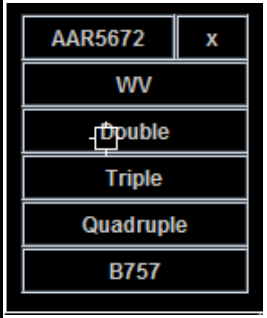
Baseline

TSS

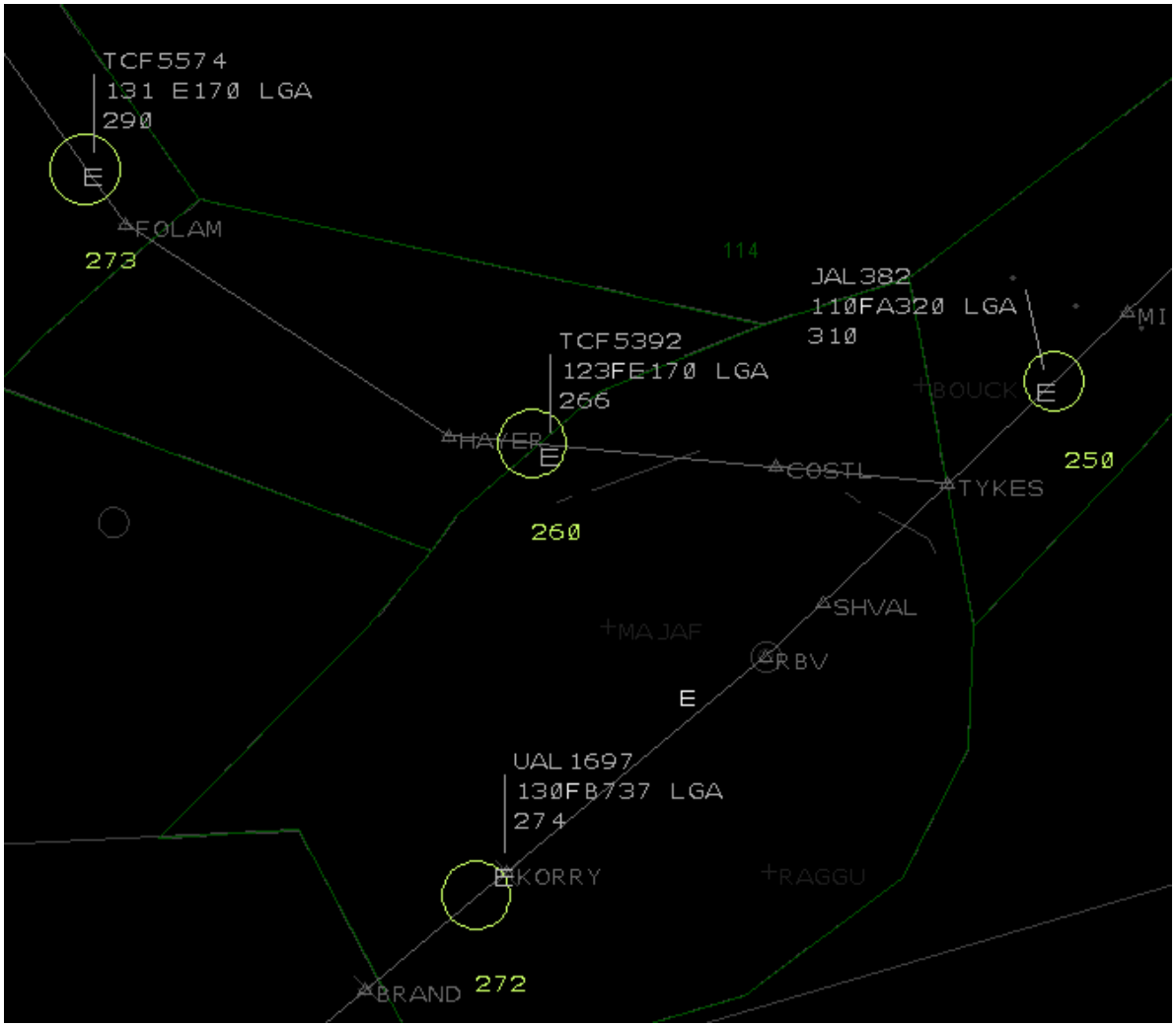


DSAS





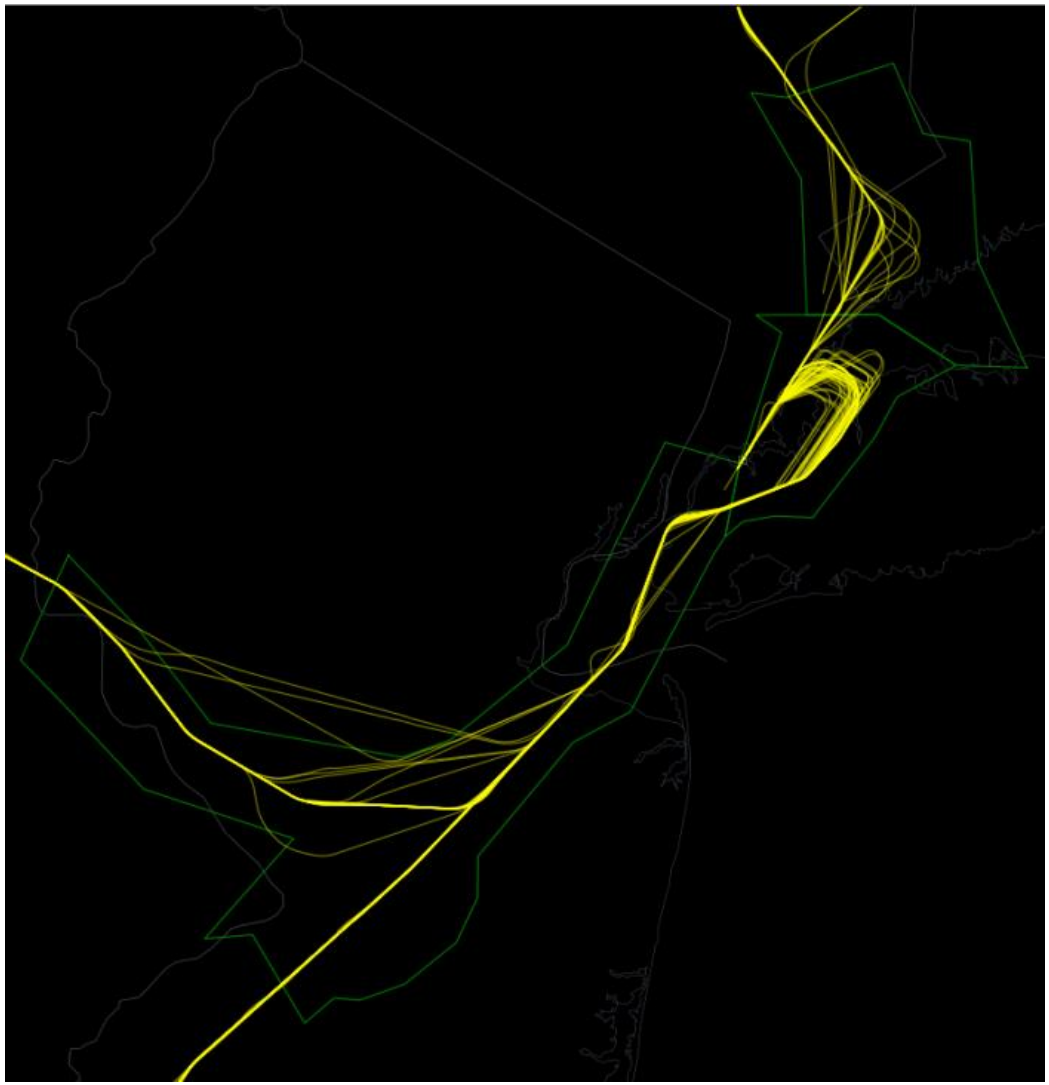
DST: Slot Markers



Results

- Lateral path conformance
- Clearances issued and distribution
- Clearance types
- Location and density of clearances
- Workload

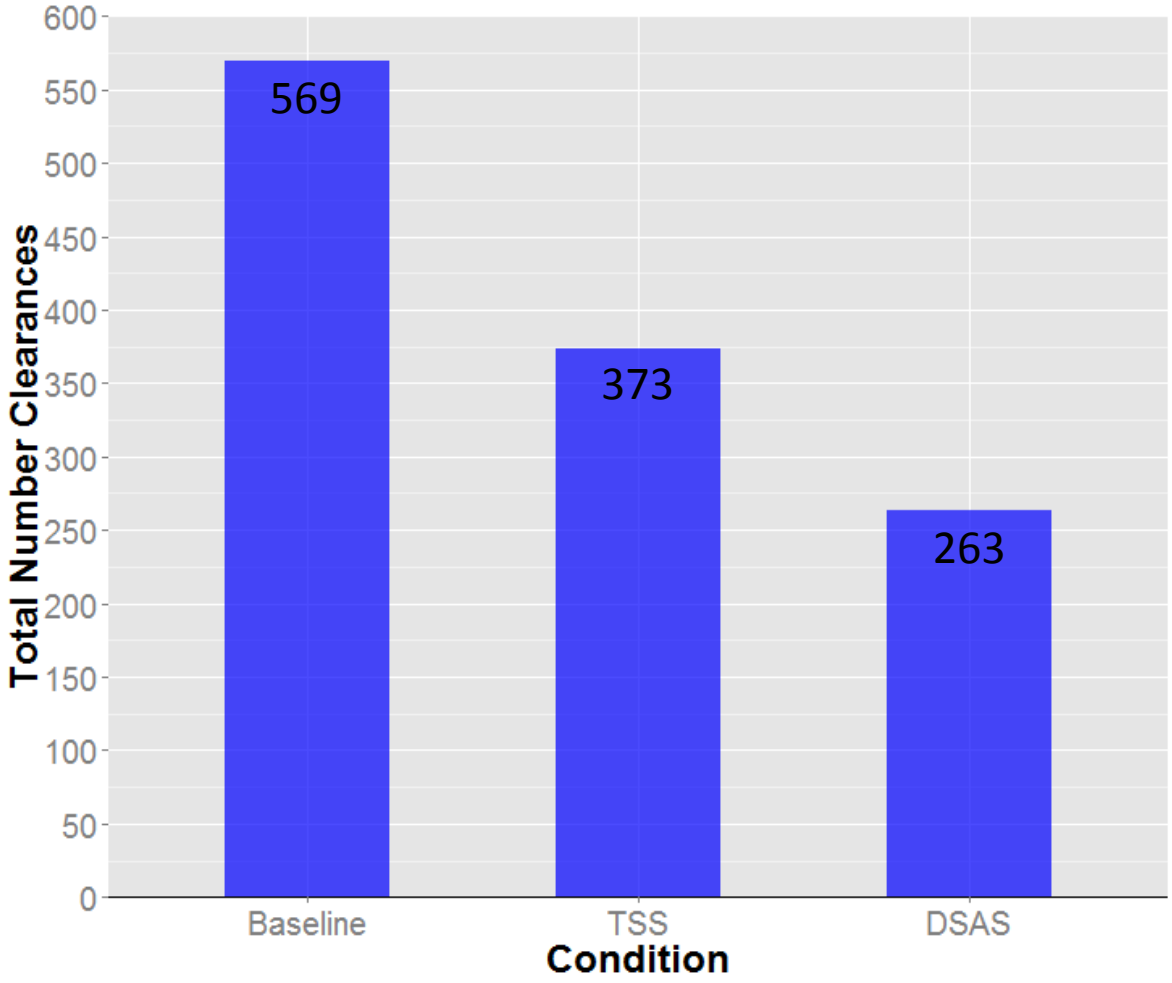
Lateral Conformance: Baseline



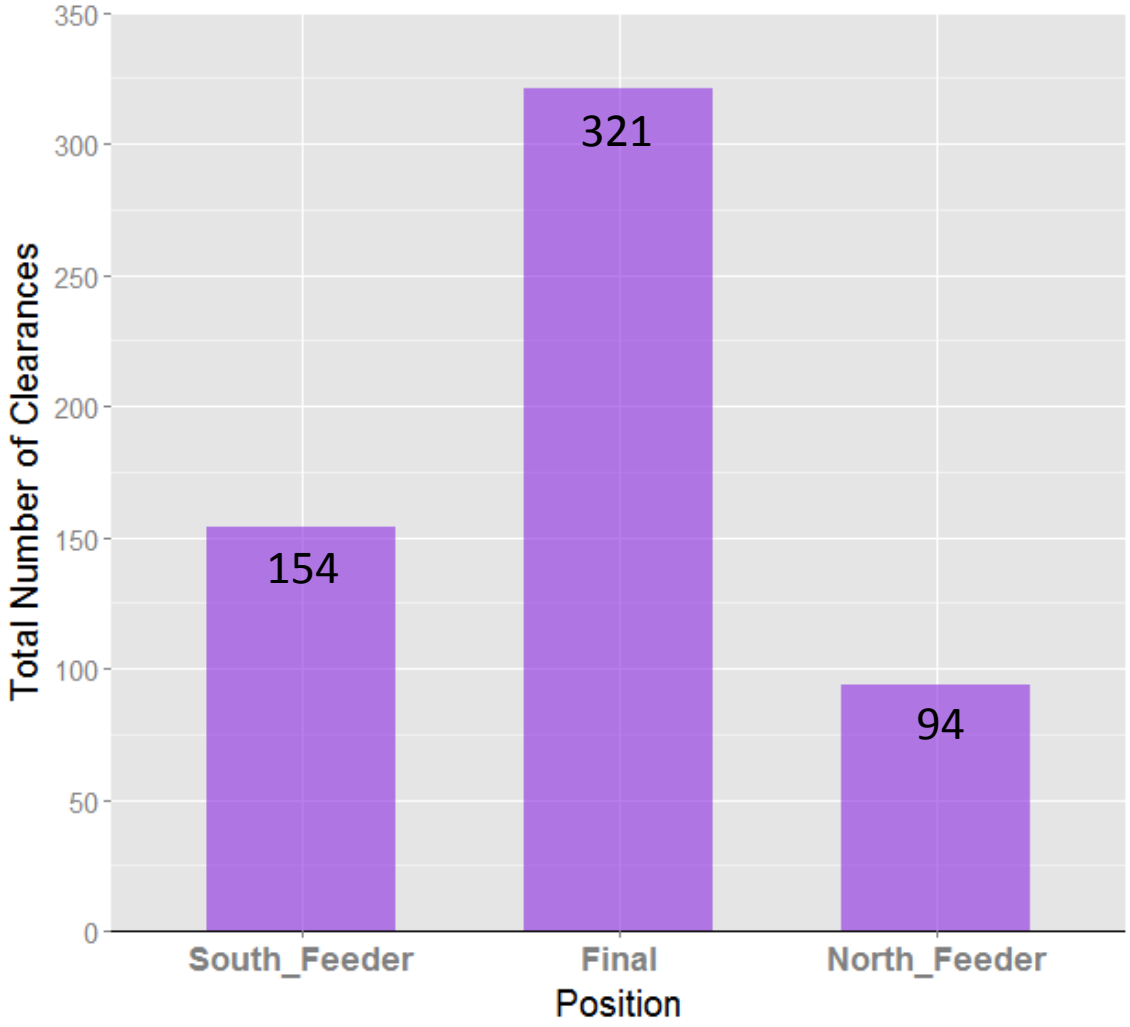
Lateral Conformance: TSS

Lateral Conformance: DSAS

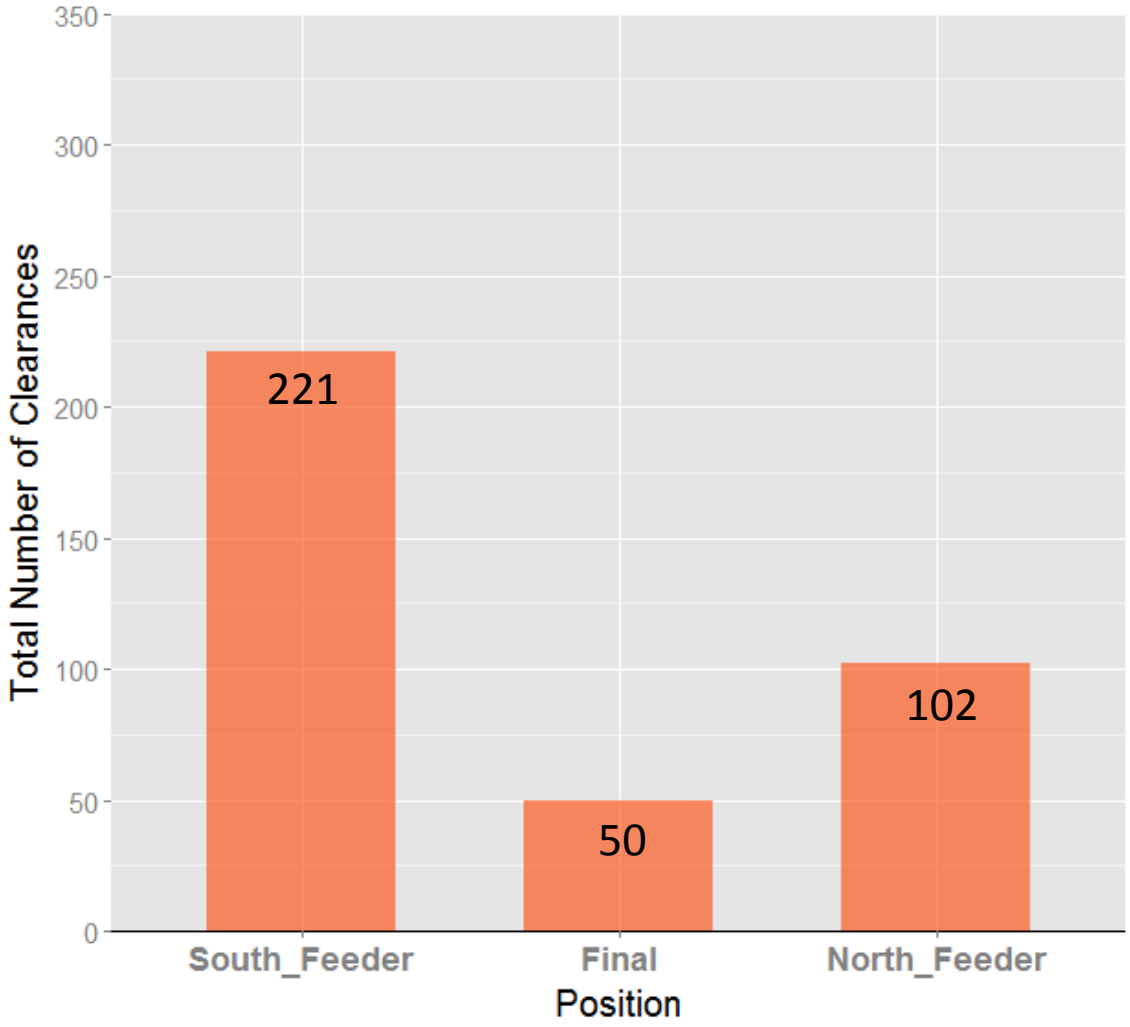
Total Clearances Issued



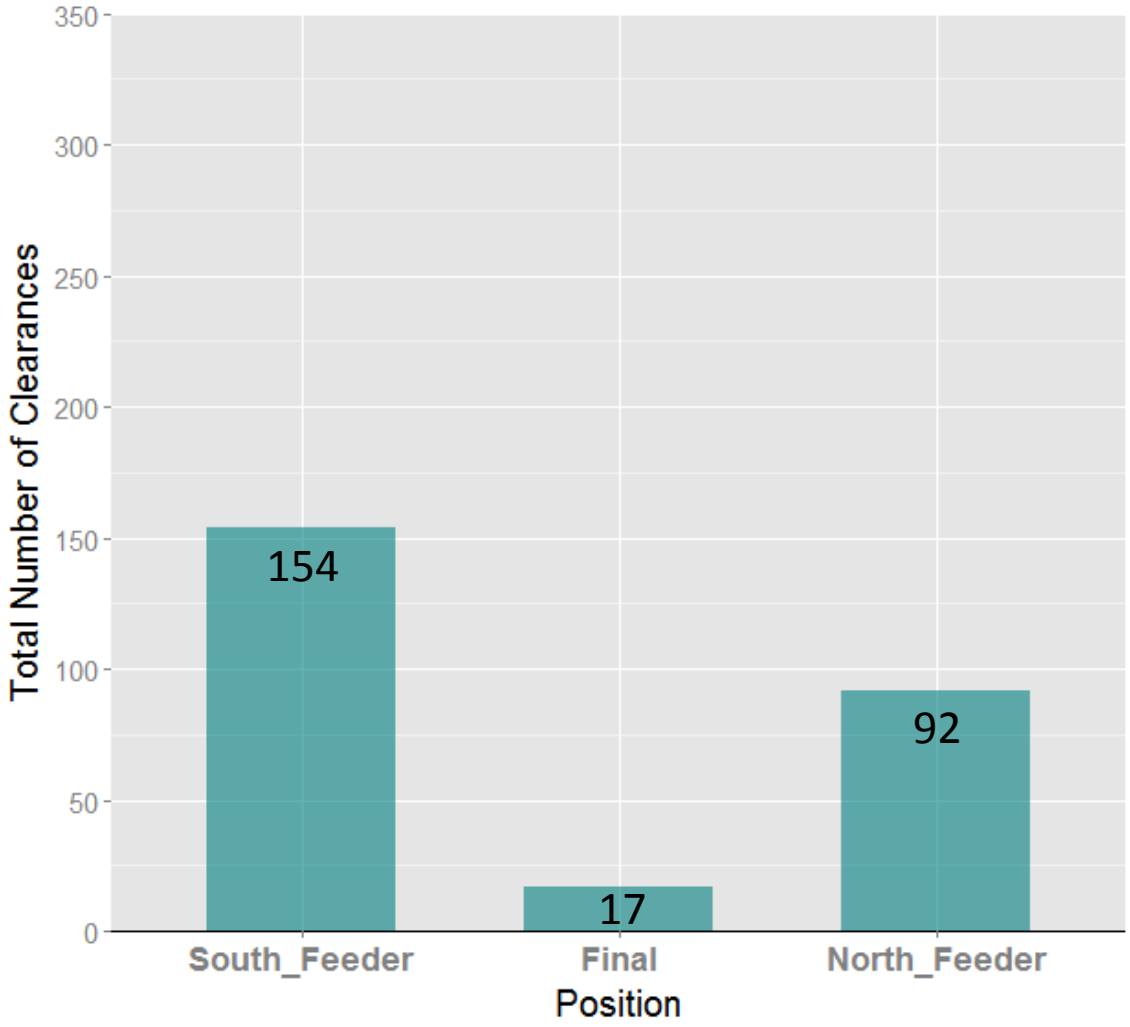
Clearance Distribution: Baseline



Clearance Distribution: TSS

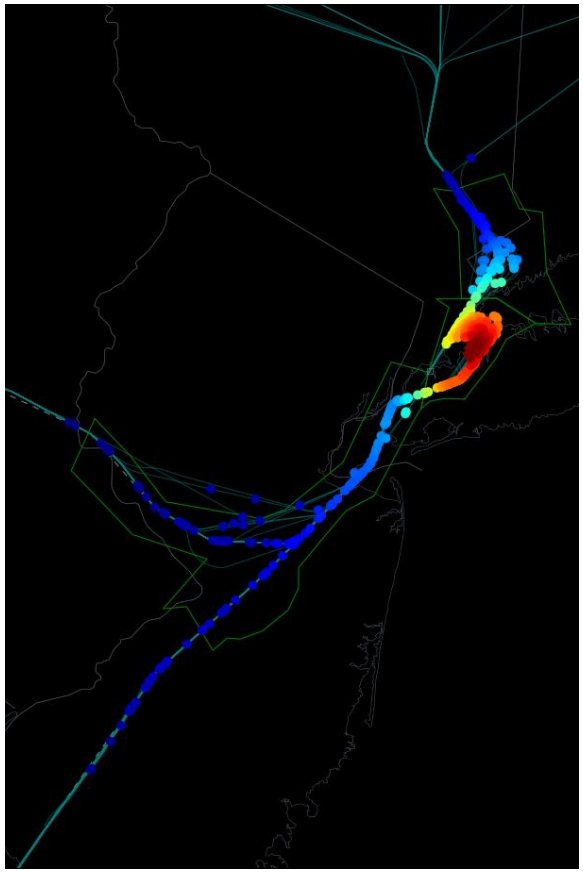


Clearance Distribution: DSAS

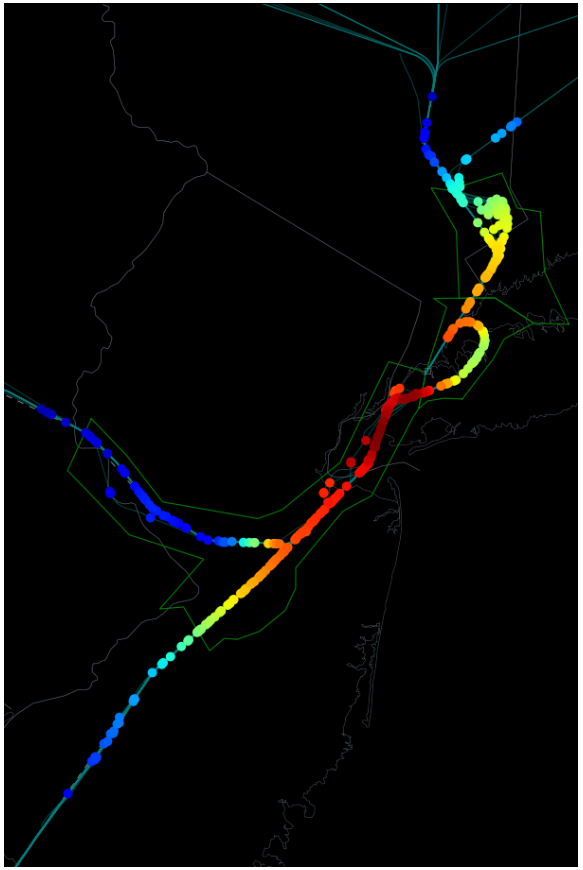


Clearance Location & Density

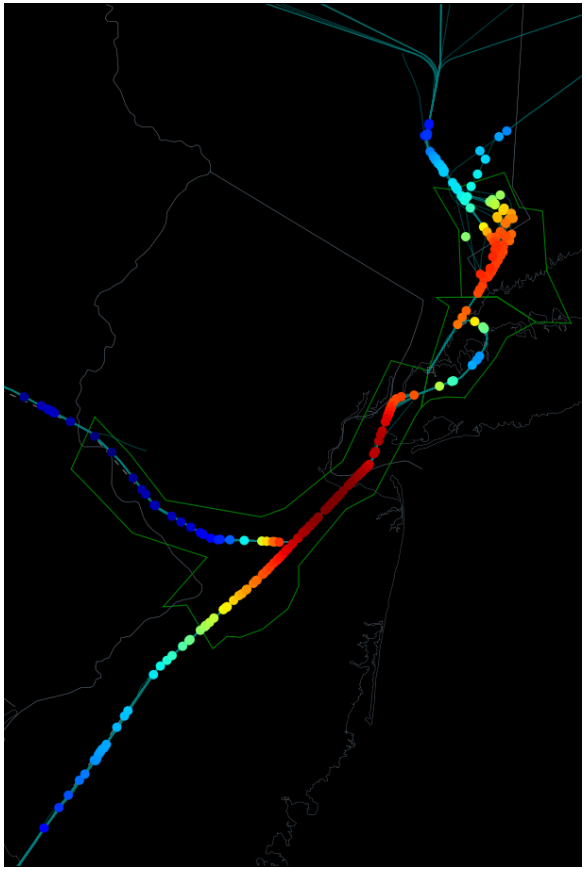
Baseline



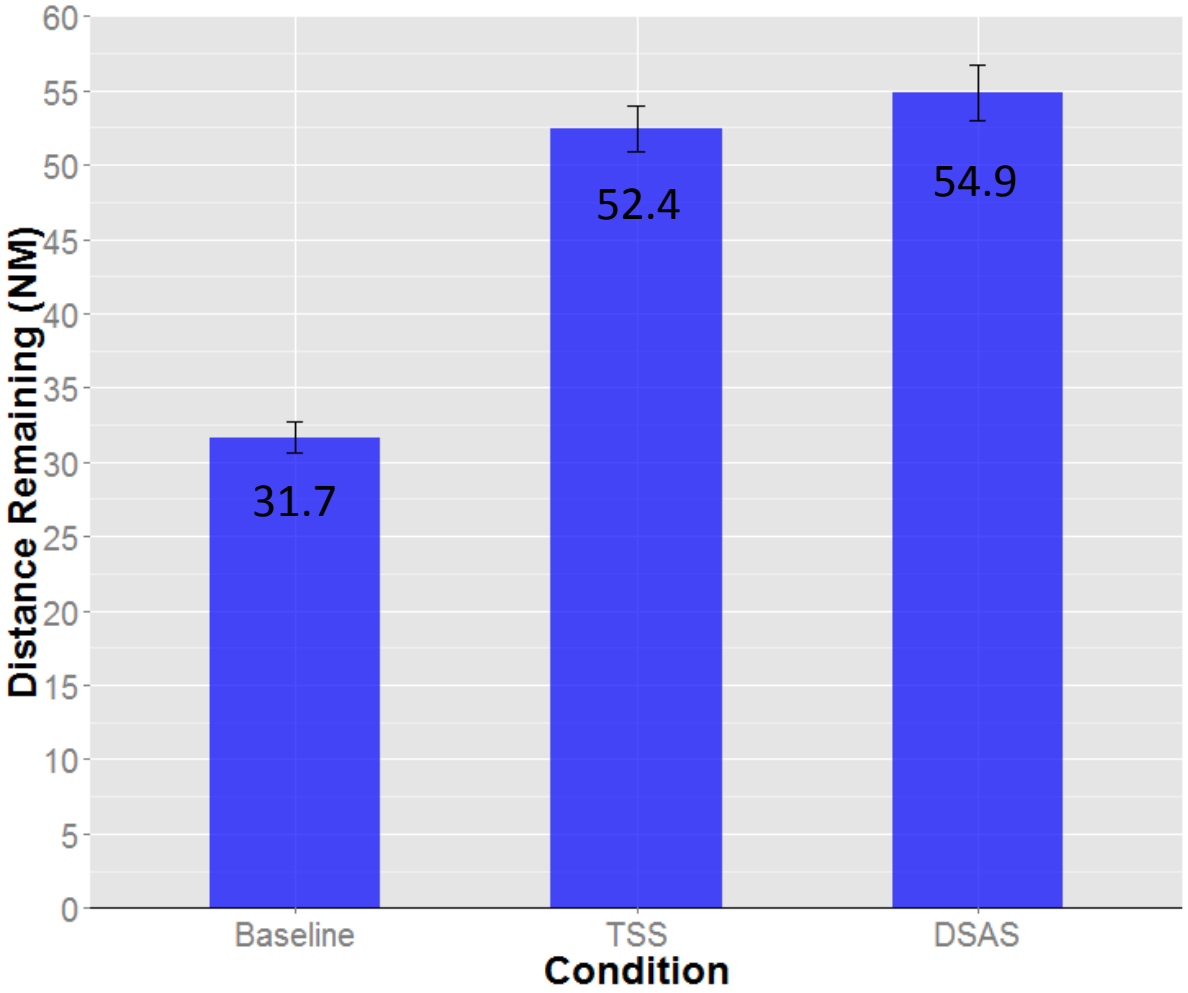
TSS



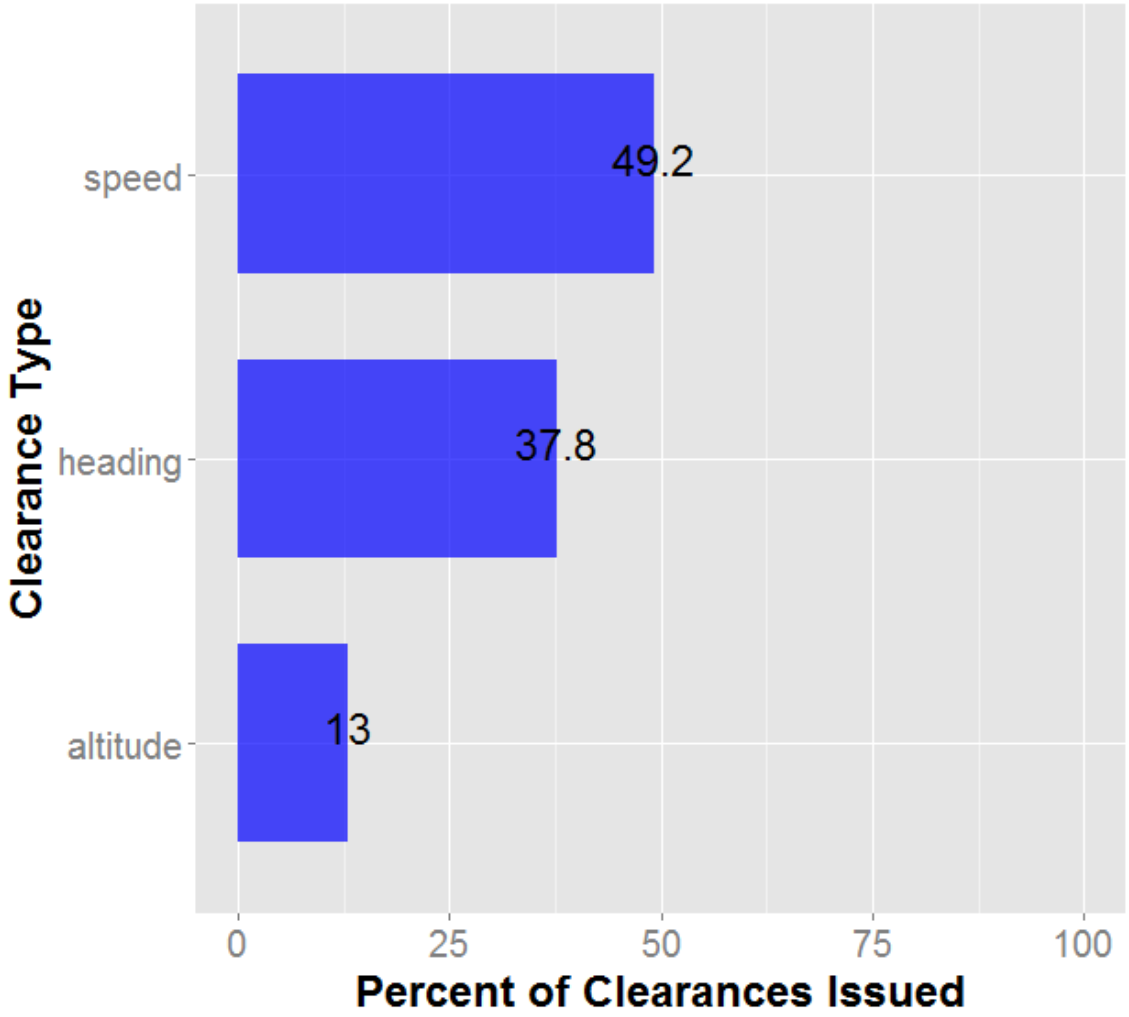
DSAS



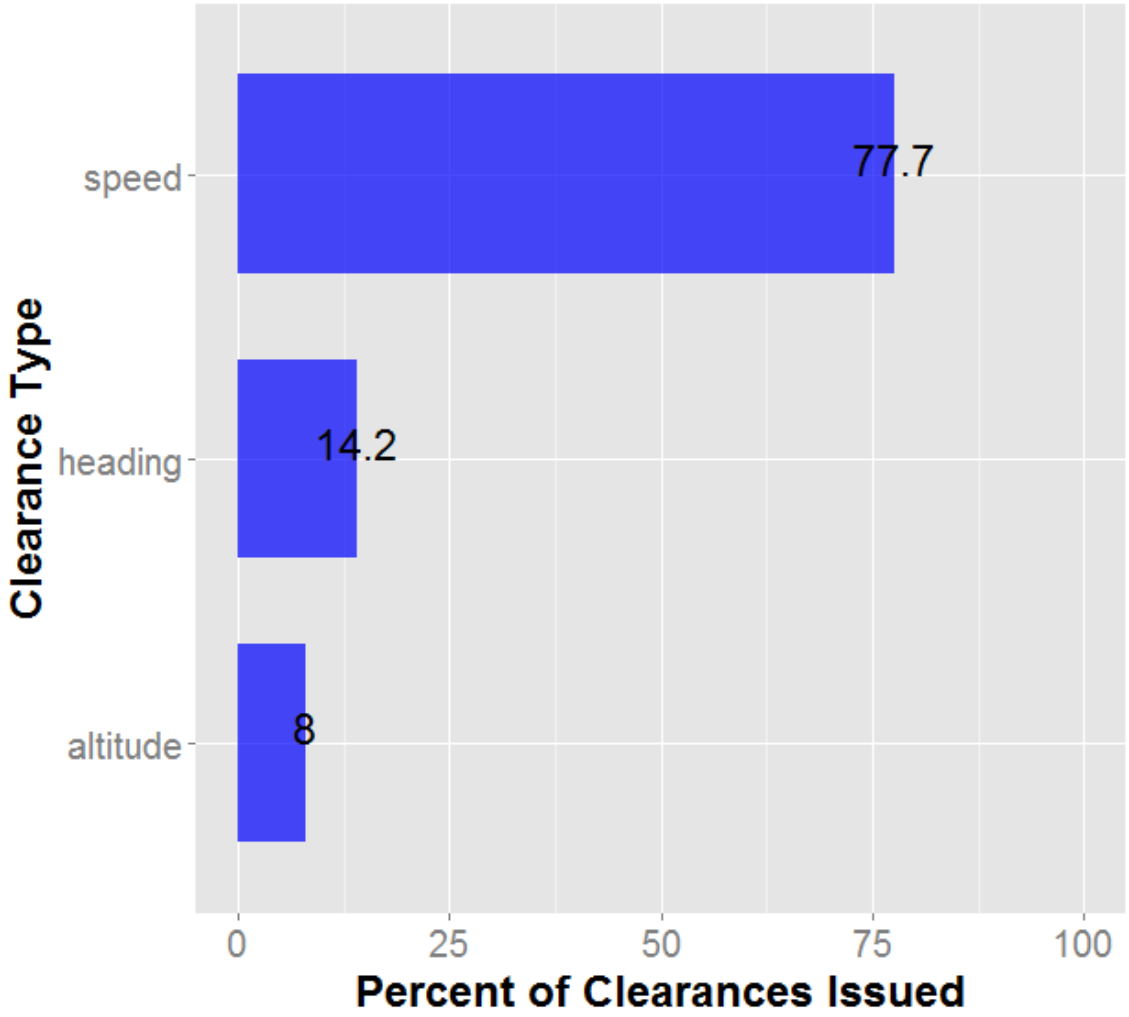
Clearance Distance to Airport



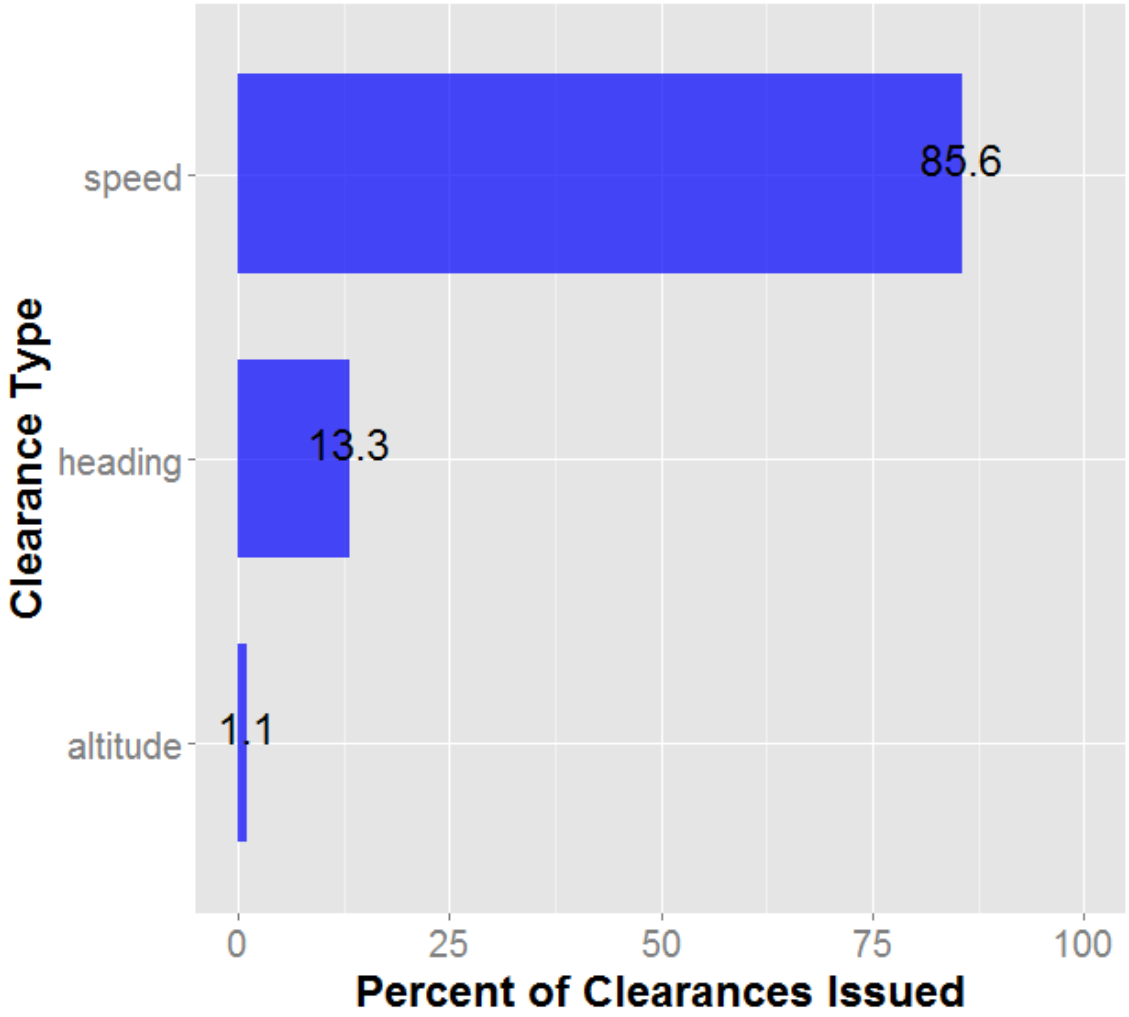
Clearance Types: Baseline



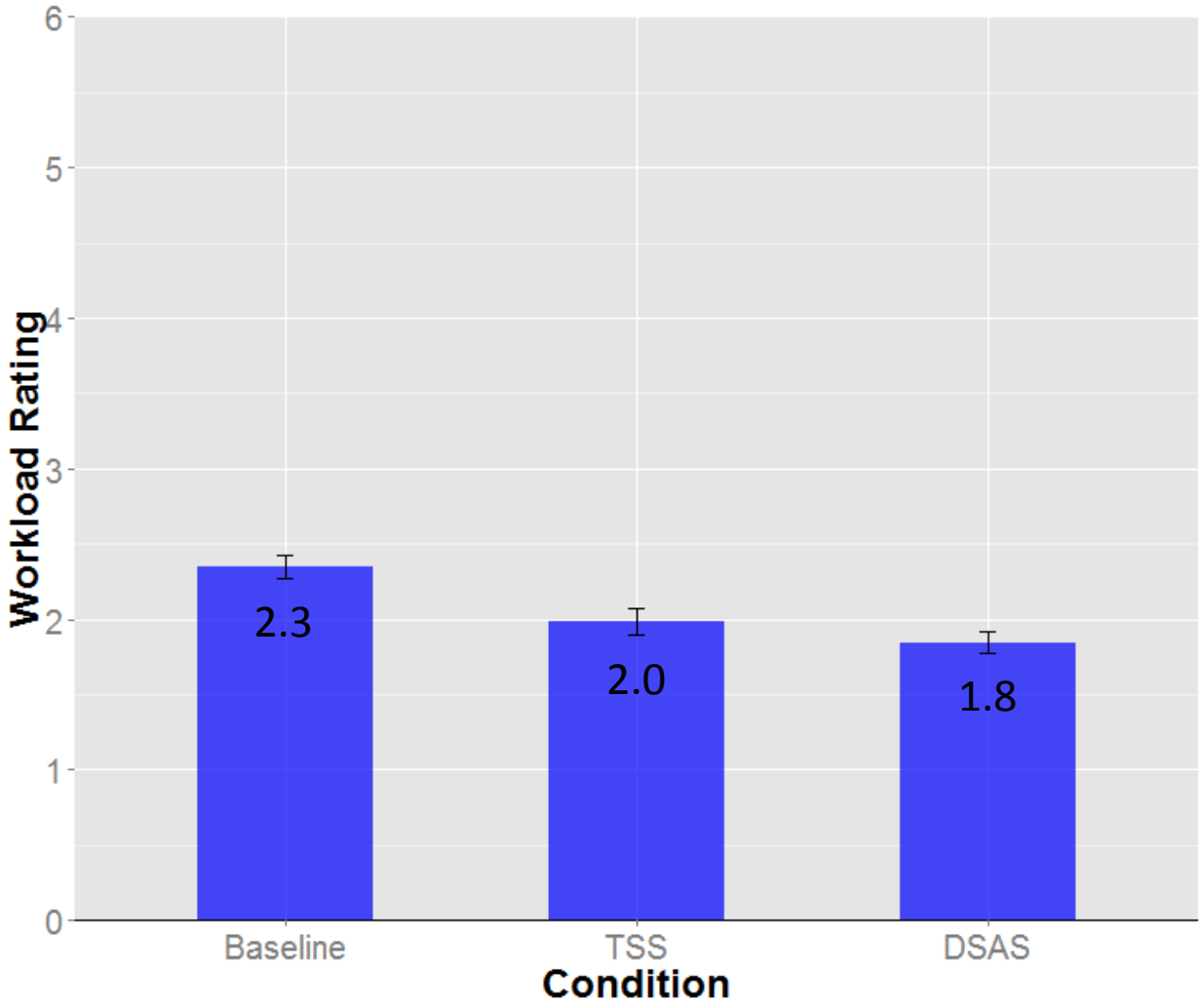
Clearance Types: TSS



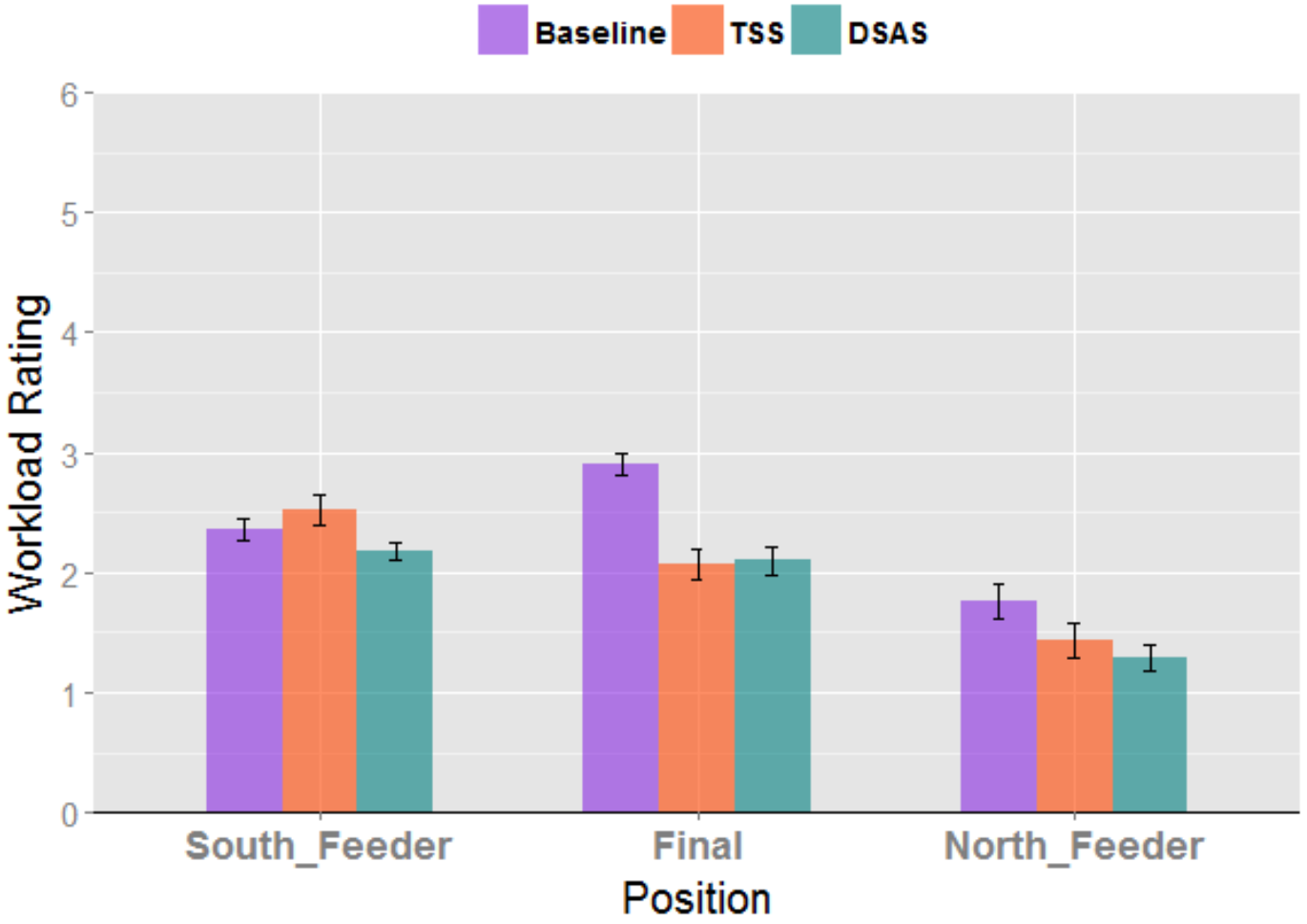
Clearance Types: DSAS



Workload Ratings

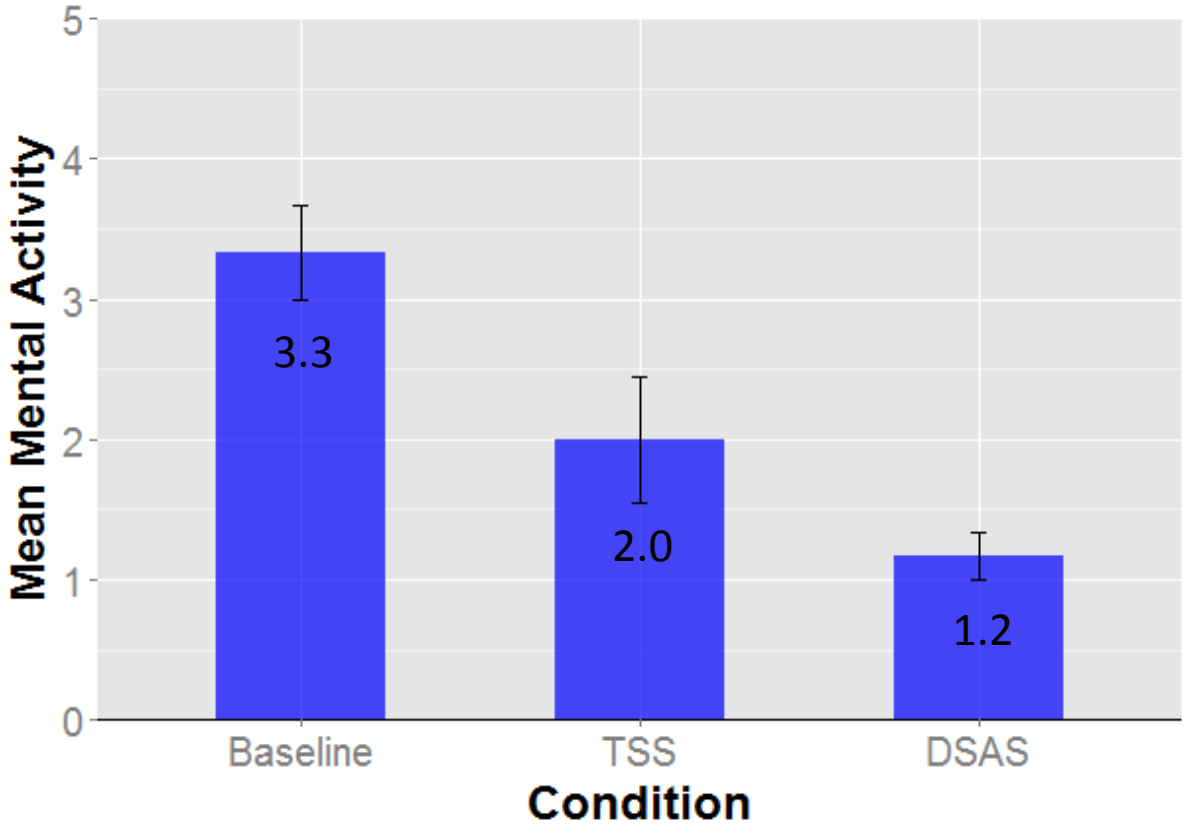


Workload Ratings by Position

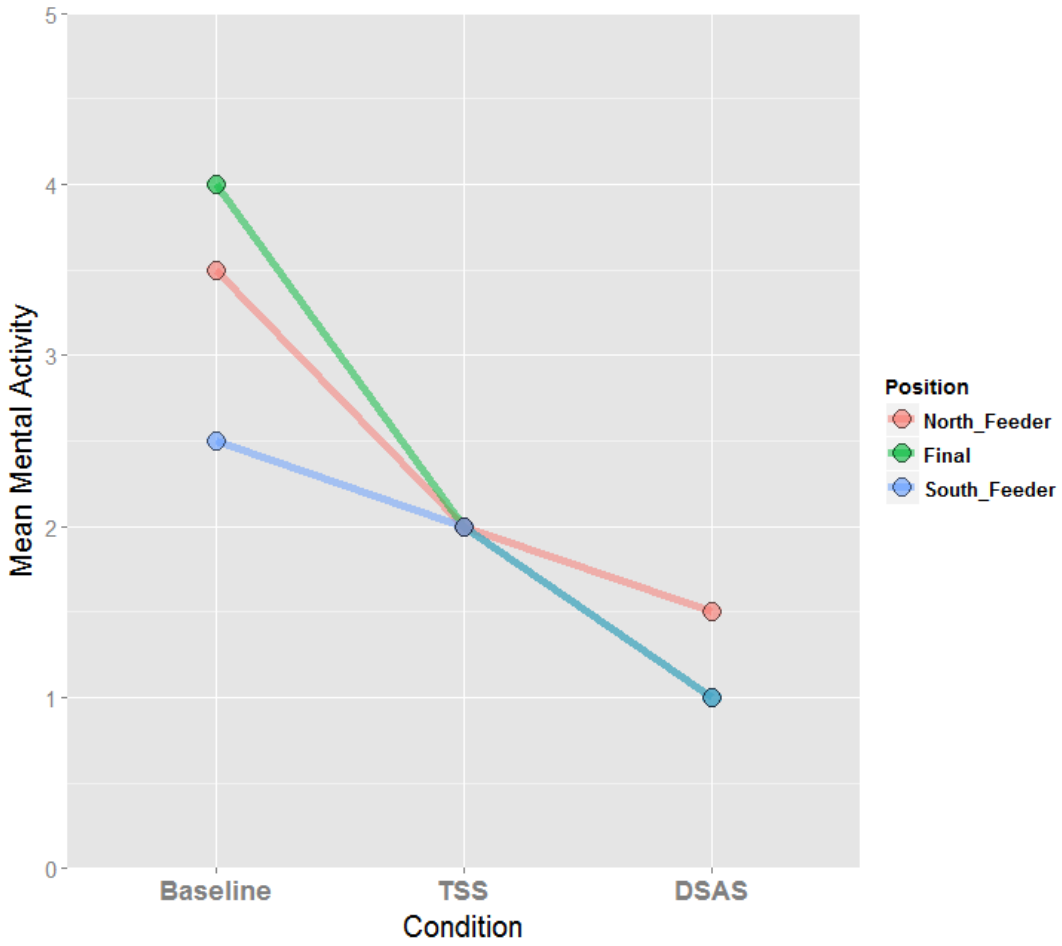


Post Run: Mental Activity

"In this run, how much mental activity was required during the busiest time?"

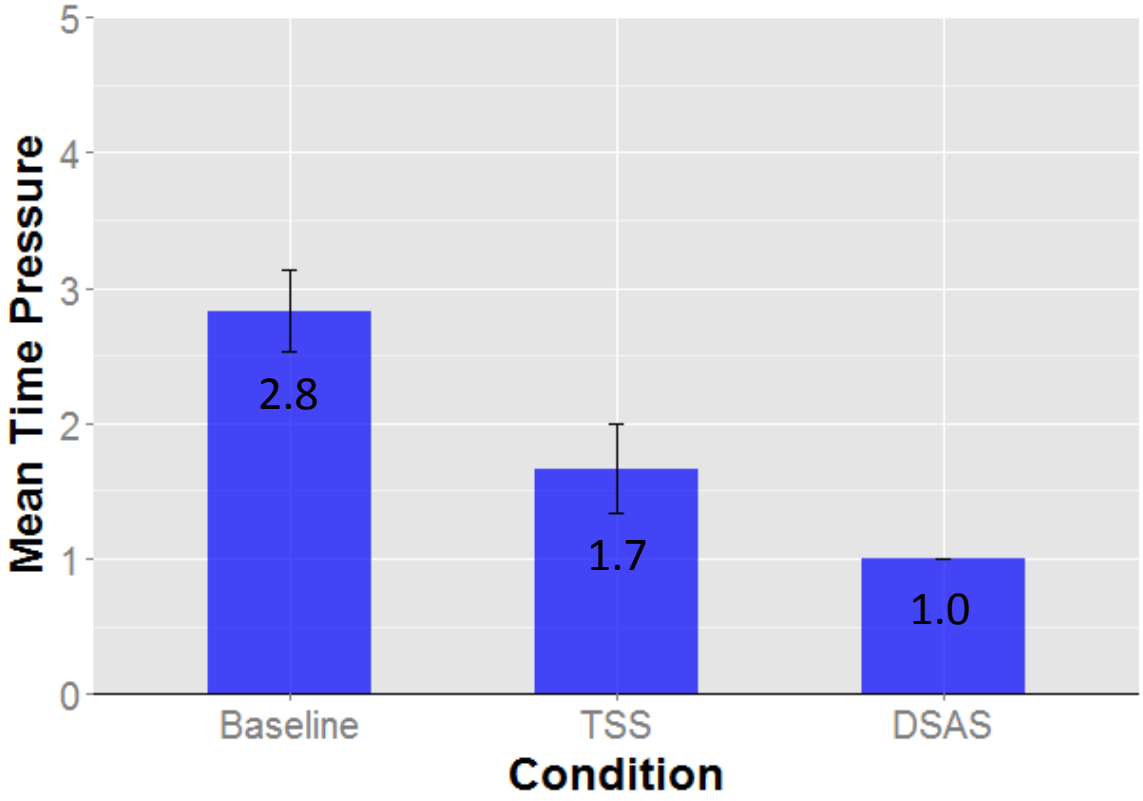


Post Run: Mental Activity by Position

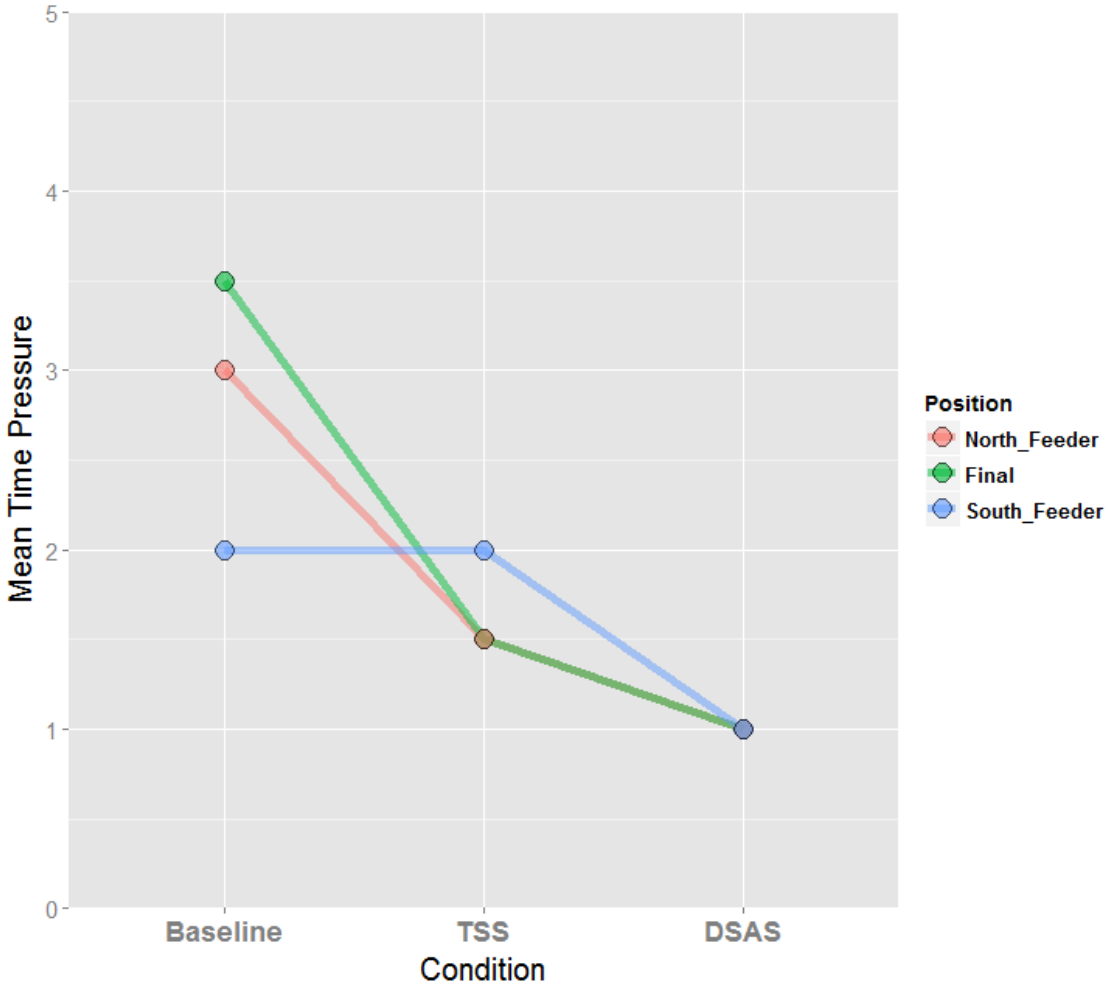


Post Run: Time Pressure

"In this run, how much time pressure were you under during the busiest time?"

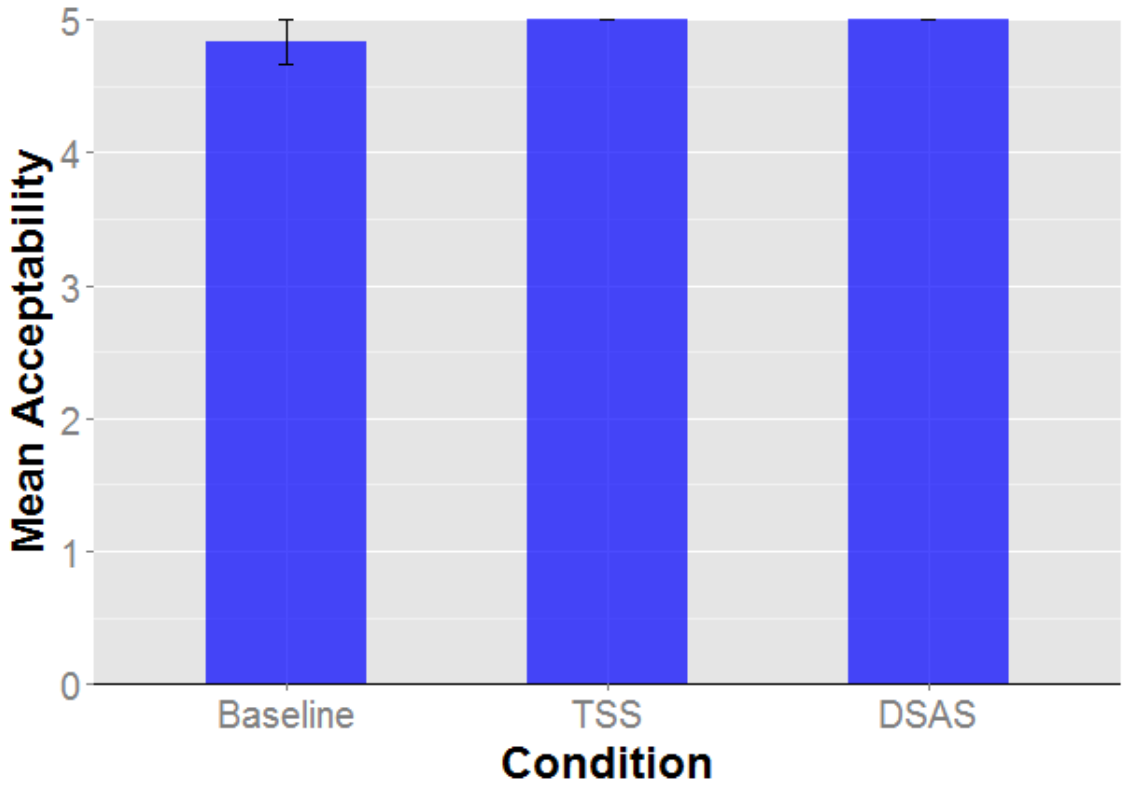


Post Run: Time Pressure by Position



Post Run: Workload Acceptability

"In this run, how acceptable (in terms of workload) were operations in your sector?"



Summary

- A HITL was conducted that examined departure-sensitive arrival delivery to LGA
- The Baseline, TSS, and DSAS conditions were compared to assess the changes in task distribution, control strategy, and workload
- Across conditions, the number of clearances required were reduced and shifted from the Final controller to the feeders
- The shift away from the airport reduced the need for vectoring and allowed greater use of speed control
- Workload reduction with TSS and DSAS and acceptable overall
- Workload shifted from Final to South Feeder across conditions

Conclusion

- The TSS and DSAS tools and the associated procedures facilitate a shift from tactical to strategic control
- Such a shift allows for a more predictable and efficient delivery of arrivals, which increases the availability for departure release
- The shift also places the Final controller in a better position to handle tactical events and unforeseen circumstances

Questions?

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