



CENTER FOR ADVANCED AVIATION SYSTEM DEVELOPMENT (CAASD)

Preliminary Results from the Simulations for Proposed CSPR Wind Dependent Departure Procedure

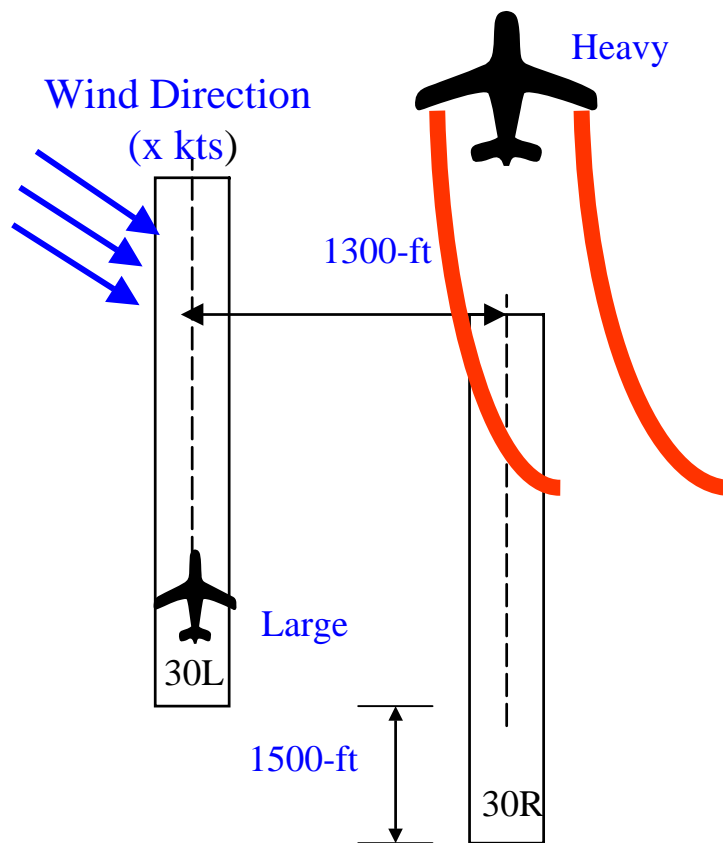
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Proposed *Mid-Term CSPR* Departure Procedure

STL Example





Overall Objectives of HITL Simulations

- **Determine ATC feasibility of the proposed procedure**
- **Identify issues and solve iteratively**
- **Validate benefit estimates**
- **Provide inputs to other program studies**



Objectives of the Preliminary Simulation

- **Determine requirements for full-up evaluations of the CSPR departure procedure**
- **Evaluate simulation characteristics and fidelity**
 - **Displays**
 - *Surface traffic display*
 - *Final approach display*
 - *Out-the-window view*
 - **Aircraft performance**
 - arrival speeds, braking rates, runway crossing times, taxi and takeoff accelerations, etc
 - **Traffic**
 - *Arrivals and Departures*
 - **Pseudo pilots, comm, phraseology**
 - **Number of controllers**
- **Conduct preliminary evaluations as possible**



Simulation Facility





Facility & Participants

- **2 controller stations, each with two displays to represent DBrite and ASDE**
- **An OTW display (shared)**
- **3 pseudo-pilots**
- **Separate display for procedure availability (shared)**

- **1 STL tower controller**
- **1 SDF tower controller**
 - **trained to conduct STL tower ops by the STL controller**
- **1 experiment conductor**
- **1 FAA observer, 2 CAASD observers, up to 3 NASA observers**



Traffic

- **VFR departures 1: 11% 757s,**
 - Actual ARTS data from STL prior to 9/11/01.
 - Departures also based on a sample of data for STL
 - no heavies. 7 757s, 5 assigned to 12L and 2 to 12R based on gates
- **VFR departures 2:**
 - All heavies and 757s to depart 12L
 - added one heavy; same overall %
- **IFR: arrivals from previous near term procedure sims**
 - Same % of H/757s for departures



Scenarios

Day 1

AM: Familiarization runs

PM: VFR, current rules
VFR, proposed procedure

Day 2

AM: IFR, current rules
VFR, transition out of the procedure

PM: VFR data run with procedure
all 757/H to depart from 12L; (winds from the south).
VFR data run with current rules;
all 757/H to depart from 12L



Results

- ***Simulation platform***
 - **simulation and all its components were deemed satisfactory for running traffic for evaluating proposed procedure**
 - Displays, including OTW
 - Traffic
 - Phraseology & communications
 - Aircraft performance
 - **some suggestions for improvements, e.g.,**
 - suggestions reducing clutter
 - DBrite/ASDE target drop
 - OTW



Results (contd)

- ***Procedure feasibility:***
 - The proposed procedure was deemed operationally feasible
 - There should not be frequent transitions in and out of the procedure due to potential for confusion
 - No problem getting into the procedure as soon as it was available
 - No other safety issues related to controller actions were identified.



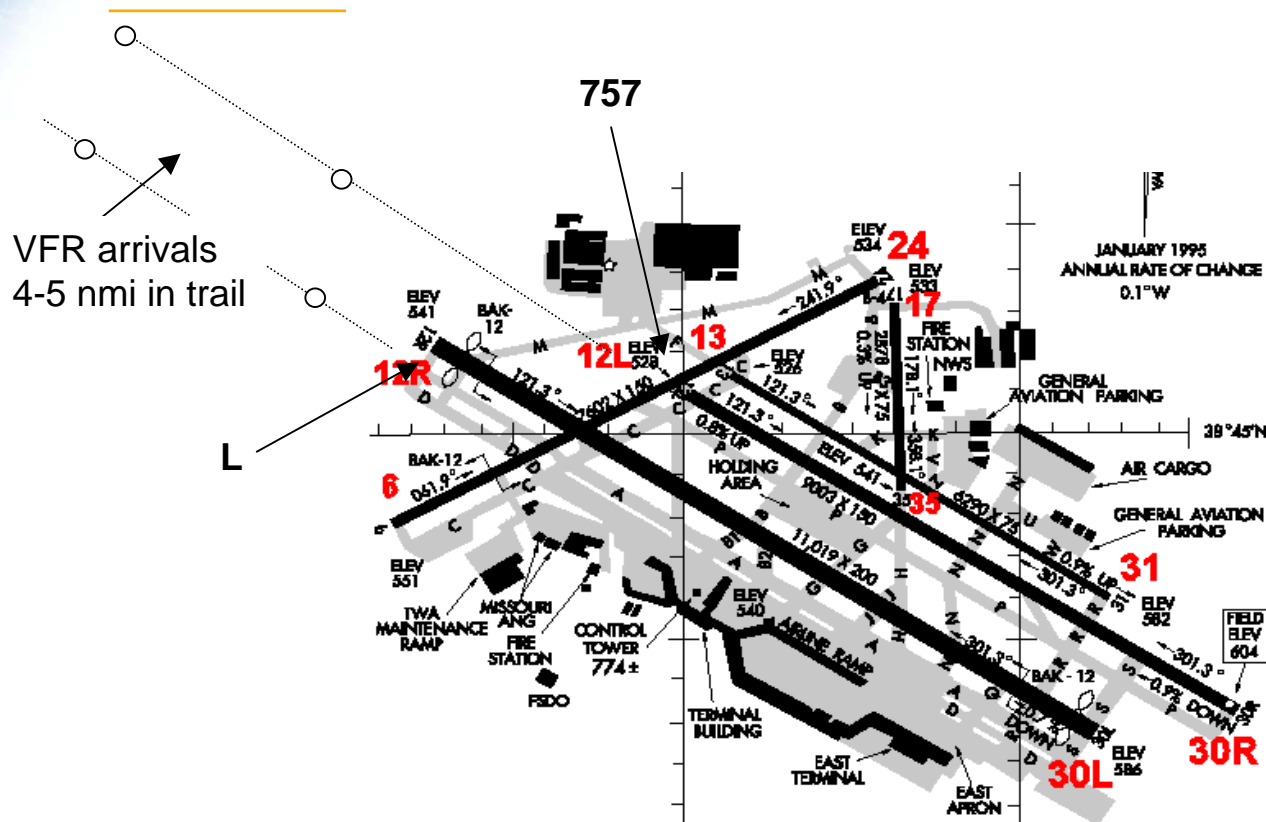
Results (contd)

- **Benefits**

- Procedure offers flexibility and opportunity in departing from the parallel runway behind H and 757s
- a/c would be assigned appropriately, in order to derive benefit from the procedure
- however
 - impact behind 757s can often be mitigated in current practice, potentially reducing the actual benefit of the procedure
 - more likely to lose a slot behind heavies in current practice
 - true whenever arrivals are co-mingled with departures
 - Probably no benefit in 757 or heavy going in the opposite direction
 - Requires 4/5 nmi due to crossing paths
 - » May be mitigated by providing longer paths through approach control; would need further consideration
 - Benefit if a prop can be launched from the other runway
 - Benefit if H/757 currently launched from the staggered runway & cross
 - Benefits in taxi times or comm not studied



Example of mitigating loss behind a 757



Launch large off 12R after first arrival to 12R; then 757 off 12L

Have to wait until next pair lands; usually satisfies departure reqts behind 757

Depends on arrival spacing. Loose a slot behind a heavy

Proposed procedure eliminates this dependence.



Benefits (contd)

Runway	Departures with current rules	Departures with proposed procedure
12L	10	11
12R	9	10
Total departures	19	21
Total gain		2
Total attributable to procedure		1



Display Information Reqts

- **Brief Discussions**
 - Provide info re procedure availability on the primary display
 - Supplementary info on secondary displays (e.g., ACE-IDS)
ok



Recommendations

- **Continue real time simulations to study**
 - **Aspects of the *benefits mechanisms* of the proposed procedure. Include:**
 - **effect of arrival spacing, order within the pair, availability of aircraft for launching, props, assigned departure gates (i.e., destination), mix of heavies and 757s**
 - **variations in balance of arrivals and departures**
 - **moving winds around**
 - **implications for taxi and comm**
 - **study of transitions into and transitions out of the procedure**
 - **IFR ops**
 - **coordinator position and a second local from STL tower**
 - **Provide sim improvements requested**



Recommendations (contd)

- **Continue real time simulations to**
 - **Verify the favorable feasibility results with the larger set of controllers and with additional workload demands if appropriate**
 - **Verify, (through sims as possible, and through debriefings,) controller planning horizons for tactical and strategic versions of the operational concept**
 - **Derive (through sims as possible, and through debriefings,) display information requirements for procedure**
- **Conduct monte carlo sims**
 - **Derive statistical estimates to include effect of lessons learned in real time sims**
 - **Reflect information about similar operations at other towers**