# Evaluation of APREQ/CFR Coordination Procedures for Charlotte Douglas International Airport

Lindsay K. S. Stevens, Bonny K. Parke, Eric Chevalley, Hanbong Lee, Lynne H. Martin, Kimberly K. Jobe, Savita A. Verma, Victoria L. Dulchinos

NASA has been collaborating with the Federal Aviation Administration (FAA) and aviation industry partners to develop and demonstrate new concepts and technologies for the Integrated Arrival, Departure, and Surface (IADS) traffic management capabilities under the Airspace Technology Demonstration 2 (ATD-2) project. One of the goal of The IADS capabilities in the ATD-2 project is to increase predictability and increase throughput via improving TMI compliance. The IADS capabilities that will impact TMI compliance are built upon previous NASA research, the Precision Departure Release Capability (PDRC) [1]. Benefit analysis results indicated substantial opportunities to reduce taxi delays for both departures and arrivals and increase throughput and predictability by integrating these capabilities [2].

In the first phase of the IADS Demonstration, the Air Traffic Control (ATC) Tower and the airline Ramp tower will receive displays that allow them to engage with the IADS capabilities. The Surface Trajectory Based Operations (STBO) Client will be placed in the ATC Tower as the primary display. The STBO Client provides situational awareness of surface traffic and uses a tactical departure scheduler to automate the APREQ/Call for Release (CFR) coordination procedures. This tactical departure scheduler leverages the TBFM/IDAC Integrated Departure Scheduling Tool (IDST) capability for APREQ/CFR coordination between ATC Tower and Center. Using the STBO Client, CLT Tower users are able to view slots in the overhead stream and submit electronic requests for release times for aircraft subject to APREQ restrictions through IDAC enabled Centers. Numerous iterations of the electronic APREQ coordination processes are possible. Release times obtained through current-day CFR procedures can be manually entered into the STBO Client. The STBO Client provides additional information on the EDCT compliance +/- 5 min windows. For flights subject to both APREQ and EDCT restrictions, ATC Tower users can plan their requests for APREQ release times so that flights can comply with both restrictions. Information on release times is shared with Ramp tower. The STBO Client can also be used to enter TMI restrictions (such as APREQs, MITs, and Ground Stops) and to provide additional input about airport operations that can be disseminated to the Ramp tower.

The Ramp tower primary displays will be the Ramp Traffic Console (RTC) for the Ramp Controllers and the Ramp Manager Traffic Console (RMTC) for the Ramp Manager. The RTC and RMTC offer users common situational awareness and decision support capabilities by displaying surface traffic information and relevant data exchange information between Ramp tower and ATC Tower. The RTC also provides guidance on gate hold for flights with tactical control flow times once The ATC-T tower has scheduled them with the Center via automation.

In March 2017, NASA conducted the human-in-the-loop (HILT) simulation to evaluate the operational procedures and information requirements for the APREQ procedures between ATC Tower and Center and data exchange elements between Ramp and ATC Tower. The simulation environment spanned CLT Ramp, ATC Tower, TRACON and ZDC Center. A 360° out-of-the-window view from CLT Ramp and a 270° out-of-the-window view from CLT Tower were also simulated. ATD-2 technology displays (RTC, RMTC, and STBO Client) were used at each

position. Scenarios included nominal arrival and departure traffic for a clear weather day at CLT with operations in both North and South flow. In each run, ZDC placed APREQ restrictions on aircraft to DCA, EWR, JFK, LGA, and PHL. Each run also contained MIT restrictions of 15 in-trail to BARMY and KILNS and flights subject to EDCTs. Participants were retired and active ATC Tower, Center, and Ramp personnel. Subjective assessment of workload was collected every 5 minutes during each run. Subjective measures in the form of surveys were collected at the end of each run and once at the end of the HITL.

The proposed paper will evaluate the APREQ/CFR process between ATC Tower and Center and information sharing between ATC Tower and the airline Ramp tower. Subjective measures collected from the HITL surveys (e.g., workload, situational awareness, acceptability & usability) and performance metrics such as TMI, TMAT, and pushback advisory compliance from APREQ/CFR flights and will be reported.

## References


[1] S. Engelland, A. Capps, K. Day, M. Kistler, F. Gaither, et al., "Precision Departure Release Capability (PDRC) Final Report," NASA/TM-2013-216533, June 2013.

[2] R. Coppenbarger, Y. Jung, E. Chevalley, T. Kozon, A. Farrahi, et al., "Benefit Opportunities for Integrated Surface and Airspace Departure Scheduling: A study of operations at Charlotte-Douglas International Airport," 35th Digital Avionics Systems Conference (DASC), Sacramento, California, September 25-29, 2016.