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ADS-B MASPS, REV A

Rationale for Maintaining High Update Rate ADS-B on the Airport Surface

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SUMMARY

This paper provides further support to Issue Paper 13 recommending that the high update rate be maintained on the airport surface.

Rannoch prepared a RTCA-SC186 white paper, dated 11/15/99, addressing the 1090 MHz MOPS (RTCA/DO-260) implementation of variable ADS-B update rate for surface operations. A low update rate of 5 seconds was specified for stopped aircraft, independent of their location on the movement area (i.e., runway, taxiway). The white paper addressed the concern that the MOPS identified mechanism to initiate the transition from a low update rate to a high update rate could introduce delays in the runway incursion alerting. This concern is associated with the case where an aircraft that was initially stopped at the hold line, then initiates taxi to violate the hold line. Ideally, a position report is transmitted within a second of the nose of the aircraft crossing the hold line.

While the timeliness of the high update rate switchover is still a concern, we further believe that the 5-second update may result in delayed alerts and false alerts. Based on our experience with implementing runway incursion avionics, we believe that it is critical to maintain positive/periodic surveillance updates during the following operations:

- Aircraft stops on the runway during a land and hold short operation.
- Aircraft stops on the runway at the takeoff hold point prior to departure.
- Aircraft stops and fails to clear the runway safety zone after landing.
- Aircraft aborts a takeoff and stops on the runway.

With a 5 second update rate, each missed reception results in 5 additional seconds of uncertainty regarding aircraft location. For instance, a single missed position report results in the failure to positively update CDTI displays and runway incursion logic for 10 or more seconds. The missing surveillance update(s) could be due to multipath interference, in-band interference, failed ADS-B unit or an "off" ADS-B unit. The tracking logic does not have knowledge of the cause of the missing update(s). An initially stopped aircraft can travel a significant distance in 10 or more seconds. Accordingly, leaving a track at a low confidence stopped location may be unacceptable. Assuming that the target has not moved when missed updates occur may result in false alerts during tight operations. Periodic updates are required to assure confidence in position.

Rannoch developed and flight tested PathProx™ runway incursion alerting avionics. Several runway incursion scenarios were tested at Dallas-Fort Worth International Airport (DFW) in October, 2000. Key to successful and timely alerting logic implementation is accurate and reliable traffic position reporting. At DFW, traffic information was obtained either via Traffic Information Services (TIS) or via aircraft-to-aircraft ADS-B surveillance. The prototype hardware at DFW initially experienced periods where traffic position reports were missed. The corresponding result was delayed runway incursion alerting.

The most reliable runway incursion alerting occurs when current positive position updates are available as opposed to alerting on predicted position. Ensuring positive

position updates requires frequent position transmissions to reduce the probability of a missed report. While our preference would be to always maintain a high update rate mode (1 second), a "stopped" update rate of much better than 5 seconds may be acceptable.

Another problem with the variable update rate is the criteria for switchover using vehicle speed. Speed estimates at the lower vehicle speeds tend to be unreliable, thus making the switchover unpredictable. The risk is that delays are introduced in determining when an aircraft has violated the hold line.