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ADS-B MASPS, REV A

**Rationale for Providing Takeoff Status Information
on the Airport Surface**

Rick Cassell & Carl Evers

Rannoch Corporation

SUMMARY

This paper provides support to Issue Paper 19 recommending that Takeoff Status be included in ADS-B messages on the airport surface to support of runway incursion alerting

The purpose of this paper is to provide additional rationale for including an indication of aircraft takeoff initiation in ADS-B messages to support runway incursion alerting. It will be shown that inclusion of such information can provide 10 seconds of advance warning of pending runway incursion conflicts.

Rannoch Corporation has developed and conducted initial testing of an aircraft based runway incursion alerting system called PathProx. The system was flight tested at Dallas-Fort Worth International Airport in October, 2000. One of the runway incursion scenarios tested involved the test aircraft (NASA B757) taking off when a test van (simulating an aircraft) moves onto the runway. As currently designed the alert generally occurred 10 seconds after the aircraft initiated its takeoff roll.

The logic for alerting in runway incursion scenarios where one aircraft is taking off involves identification that the aircraft is actually taking off. Using the data currently defined in the ADS-B MASPS this can be done based on the speed and acceleration information. The criteria must clearly the aircraft in the takeoff mode, as opposed to simply taxiing. Therefore the aircraft must have a combination of either high speed (generally greater than 40 knots) and/or high acceleration. If other information can be provided that indicates the aircraft is starting the takeoff roll, it can result in incursion alerts for departures being generated up to 10 seconds sooner than is currently possible.

There have been several runway incursions recently that involved aircraft in this specific scenario. Several resulted in near collisions where the aircraft taking off was able to climb over the incurring aircraft on the runway. One such incident occurred at Chicago O'Hare on April 1, 1999. In that incident an Air China 747 cargo plane landed on runway 14R and was cleared to turn off the runway to proceed to the cargo ramp. The controller cleared a Korean Air 747 for takeoff as the Air China plane was clearing the runway. The Air China plane mistakenly turned back onto 14R as the Korean Air plane was taking off. As the Korean Air 747 approached rotation speed, the pilot saw the Air China plane and abruptly rotated his aircraft, banking to the left as he climbed. The Korean Air plane crossed 25 to 50 feet over the top of the Air China plane. For runway incursion scenarios such as this, additional information regarding takeoff status will enable alerts significantly sooner in most cases, which would allow a much safer conflict resolution.

In this paper we can make no comment regarding the specific method for indicating takeoff status. There are several options including brake release and engine power. Whether these or other available status information is the best indication has not been evaluated. If a specific method can't be defined at this time it is recommended that provision be made to accommodate including this information in surface ADS-B messages for future use.