

WAAS Technical Report
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WAAS User Messages lost from WRS receivers after faulted GEO PRN 135 GUS switchover on 5/17/2017.

The uplink for the CRW GEO, PRN 135, switched from the Napa uplink site to the Littleton uplink site at 16:50:29 GMT (319846 GPS TOW) on 5/17/2017 after a fault was detected. This caused an 18-second outage of the WAAS User Messages (WUMs) broadcast from GEO 135, as reported from to the GEO message integrity evaluation. The GEO message integrity evaluation uses a collection of WAAS receivers to verify that the GEO navigation message data stream is continuously received by users.

The WAAS position accuracy evaluation uses a collection of WAAS and NSTB receivers to evaluate WAAS navigation accuracy, LPV service availability, and integrity. This process only detected a 14-second WUM outage from the CRW GEO because the NSTB receiver at Arcata was able to acquire and track the GEO satellite signal faster than all the WAAS receivers used in the evaluation.

The last WUM received from CRW GEO during the event was at 16:50:29 GMT (319846 GPS TOW), and the first WUM received from WAAS receivers was 18 seconds after the event at 6:50:48 GMT (319865 GPS TOW). The NSTB GPS/WAAS receiver at Arcata was able to track and provide a valid WUM from the CRW GEO 4-seconds earlier at 6:50:44 GMT (319861 GPS TOW). Most WAAS receivers took 3–16 seconds longer than the Arcata receiver to acquire and track the GEO after the faulted GUS switchover. The WAAS receivers in Alaska that tracked the CRW GEO at low elevation took 10–600 seconds longer to acquire and track the satellite, and Kotzebue, thread C, did not track the CRW GEO for 1450 seconds after the faulted GUS switchover.

The WAAS receivers not only had slower acquisition of the satellite than expected, but they also did not provide a valid WUM for 2–3 seconds after satellite tracking was established. The WUMs sent after initial satellite acquisition in DCP rate group 1 had an invalid time stamp (0 GPS Time) with all 250 bits set to zero which, combined with slow acquisition, increased the number of reported lost WUMs.

When a GEO GUS faults and a switchover to the backup is commanded, 12–16 WUMs are expected to not be broadcast due to the event. Analysis of several faulted GEO GUS switchovers on 3/14/17, 3/27/17, 4/15/17, and 5/24/17 has confirmed that lost WUMs have increased relative to past performance. The number of lost WUMs after a GUS fault has increased and risks interrupting WAAS LPV and RNP services in a single GEO coverage region.