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Independent Position Validation in Russia

Aireon has developed an Independent Position Validation solution that leverages both the aircraft's transmitted ADS-B information and the overlapping space-based coverage provided by the Iridium satellite constellation to determine the validity of a reported ADS-B position.

Automatic dependent surveillance-broadcast (ADS-B) allows for accurate and reliable surveillance of aircraft that uses GPS to determine the aircraft's position. Through ADS-B, the GPS position is transmitted to receivers and that information is conveyed to Air Traffic Control. But what happens when something goes wrong with GPS and the information being transmitted by ADS-B can no longer be trusted? If GPS signals are compromised — for example jammed or spoofed — it can lead to the aircraft not transmitting its position, or worse, transmitting the wrong location, which is of significant concern for everyone in the airspace, but particularly for aircraft operators and air traffic control organizations.

Through a combination of the aircraft's kinematics and Time Difference of Arrival (TDOA) calculations, Aireon can determine the validity of a reported ADS-B position, indicating if it is or is not within a user-defined radius. Part of this determination is the construction of an independent reference track. The reference track is an internal estimate of the aircraft's truth position. In most cases this estimate is collocated with the

reported position, but in regions of GPS interference, Aireon can see the reference track diverge from the reported position when the aircraft's reported ADS-B position is no longer accurate.

In the following example, from October 2020, there was a major discrepancy between the GPS reported location and the Aireon reference track location. The aircraft's reported position (illustrated in red dots) appears unremarkable, following a normal route outside of Moscow, Russia. However, upon closer inspection, the figure shows that the aircraft is taking off and landing offset by about 8NM from the truth location, which is illustrated by the blue dots. Considering that horizontal separation minimum for aircraft under ADS-B surveillance is 5NM, this could represent a significant safety concern if ATC is unaware of any problems and the actual location of the aircraft.

These figures show both the reported aircraft position and Aireon's estimate of the truth position through the independent reference track. The reference track initializes at the aircraft's reported position but then begins to move toward the truth position. The reference track is a good estimate of the actual position, based on the aircraft's arrival data at the airport. The reported positions, on the other hand, show the takeoff and landing far from the airport.

Aireon's Independent Position Validation solution is currently operating globally for evaluation and is planned for operational use in 2024.

FIGURE 1

The entire flight path of a Boeing 737 passenger flight in Russia.

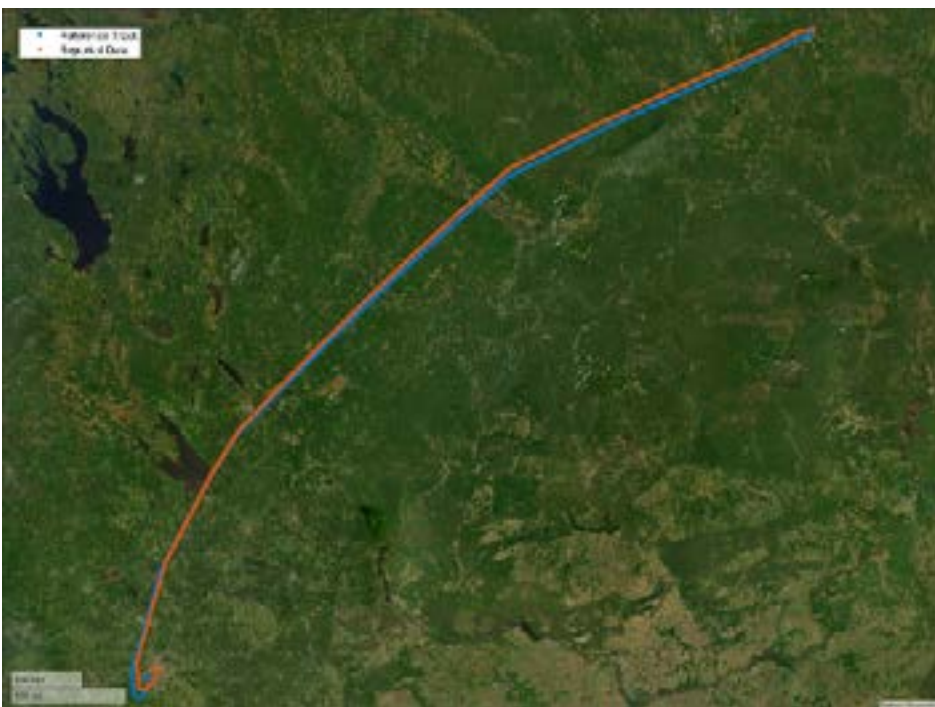


FIGURE 2

Close-up of the reference track vs. reported track at departure.



FIGURE 3

Close-up of the reference track vs. reported track at arrival.

