

# **United Airlines**

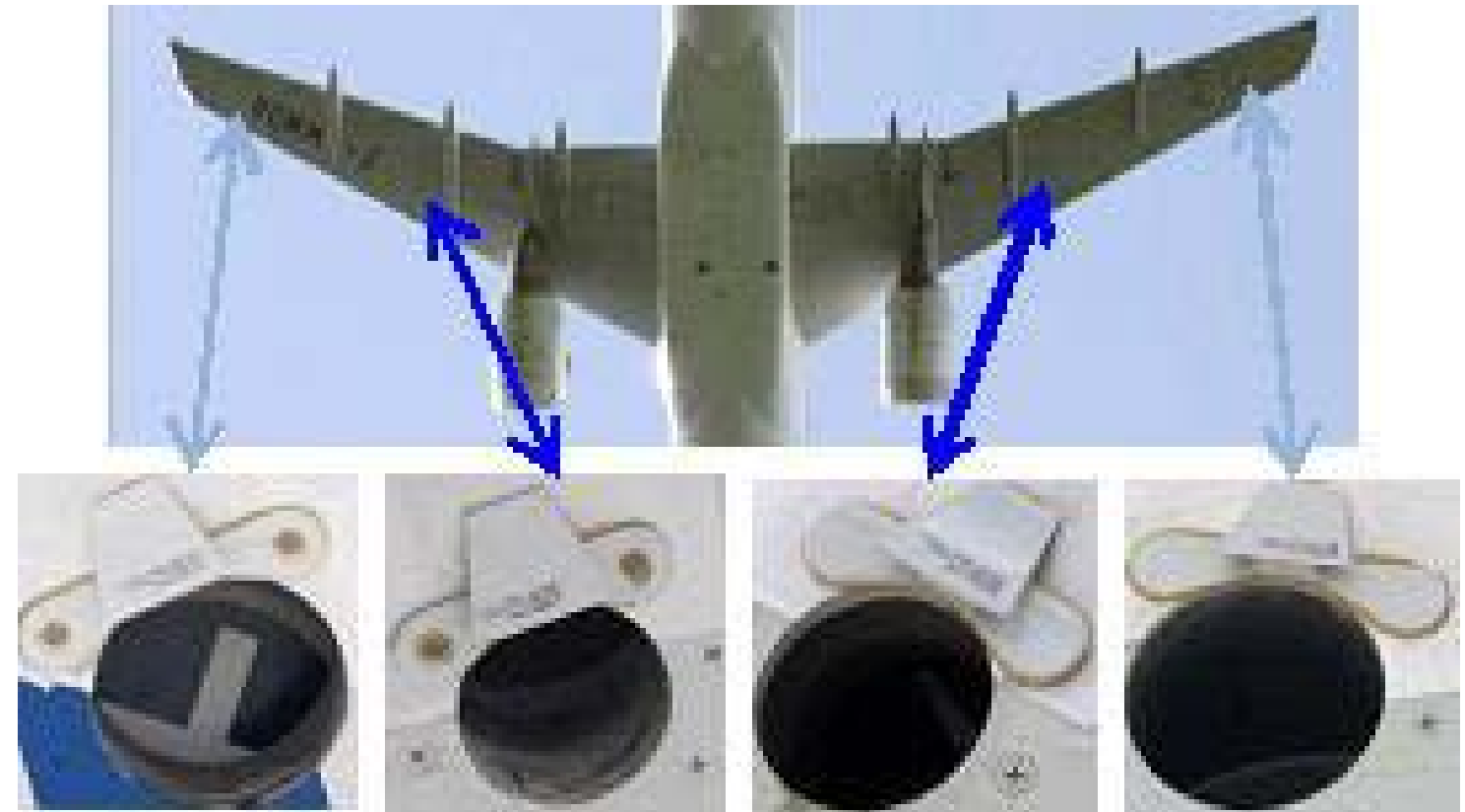
## **Airbus A320 Vortex Generators**

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# Airbus A320 vortex generators

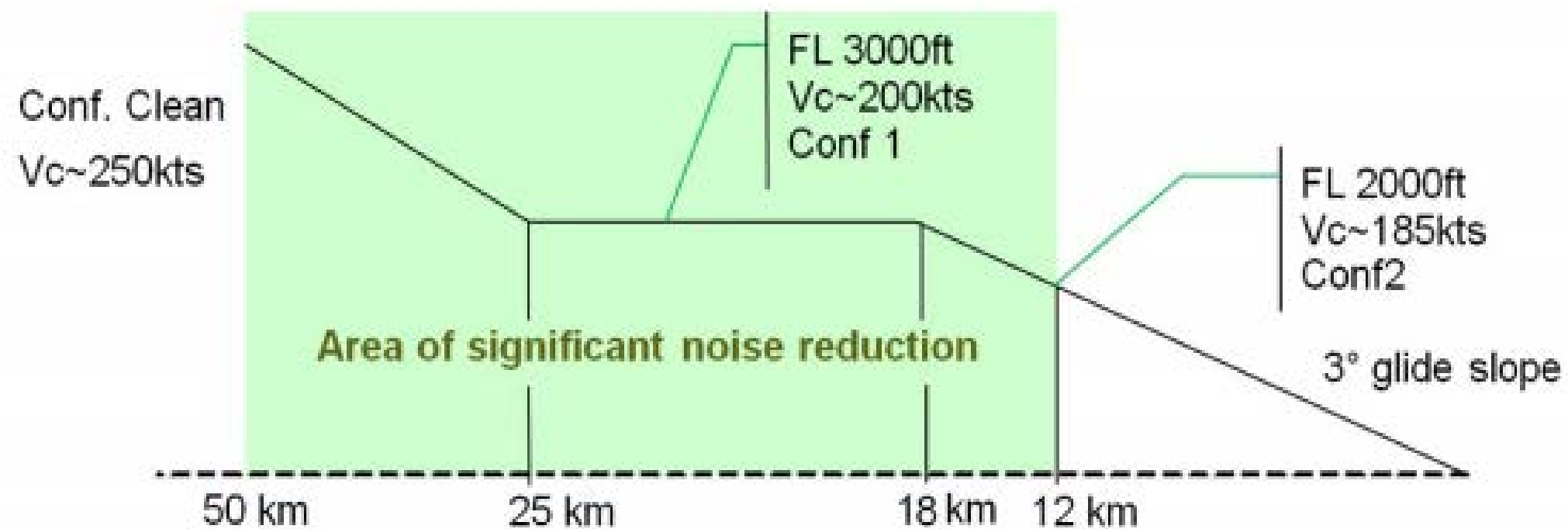
- United has recently begun the process to retrofit our Airbus A320 family of aircraft (A319 and A320) with devices that reduce tonal noise cause by airflow over the Fuel tank Over Pressure equalization Ports (FOPP).
- This follows from previous work by Airbus and European operators to develop and successfully implement these devices.



# What do the FOPP vortex generators do?

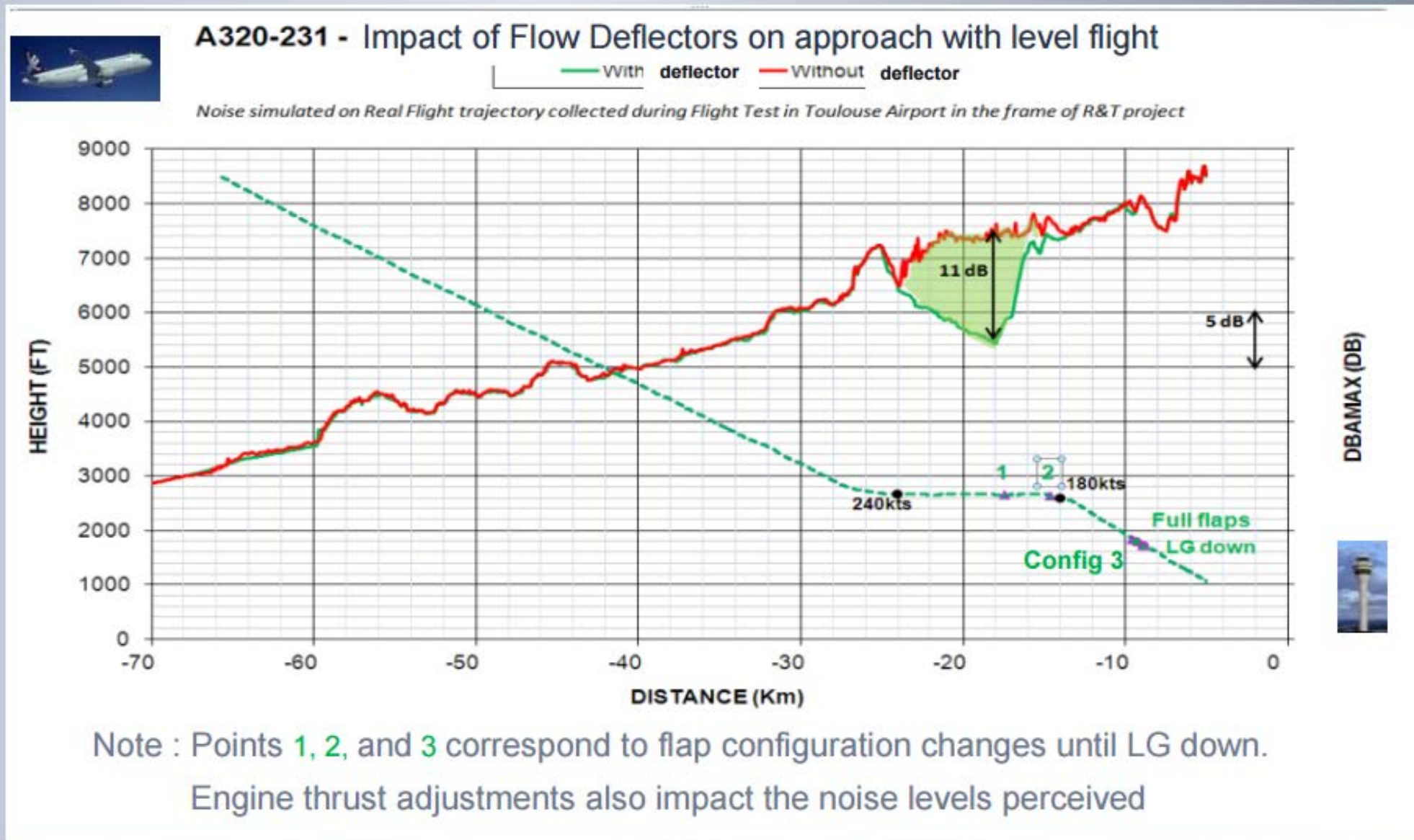
Flight tests demonstrated the benefits of the FOPP vortex generators:

- Typically between 12 to 40 km (7.5 to 25 miles) from landing on approach
- Benefits also when operating continuous descent approaches



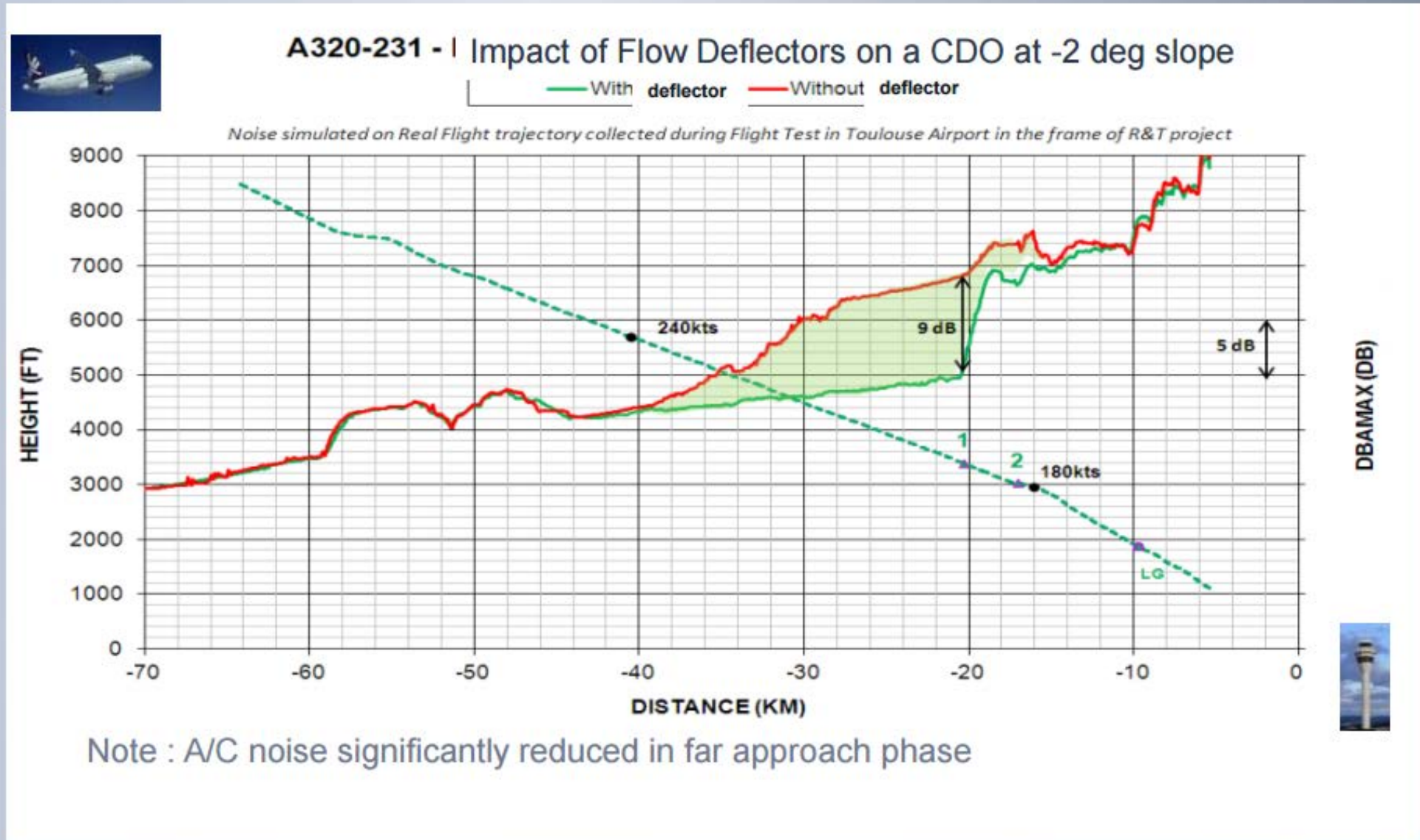
# Impact of FOPP vortex generators on approach

## Flow deflectors for the A320 Family - test data



# Impact of FOPP vortex generators on OPD

## Flow deflectors for the A320 Family - test data



## Change is happening!



United works in partnership with the Federal Aviation Administration, international air navigation service providers and our airport partners to improve the noise levels around our airports. Our top noise-reduction tactics include investing in new, quieter, more fuel efficient aircraft and supporting the Next Generation Air Transport System (NextGen), which includes implementing quieter flight procedures.

**Additionally, in 2016, we began working with Airbus to retrofit our A319 and A320 fleet with vortex generators to reduce the unique whistling sound that occurs at slower speeds. Delivery and installation will begin in early 2017.**