



Wind Urchin for Turbulence Measurement at Airports

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An industry sponsored civil aviation safety report, showed that, in the decade to 2012, most aircraft accidents occur during the descent and landing (57%) followed by take-off/climb stage of the flight (24%) . Given the importance of this sector to global trade (€2 trillion) any improvement in the knowledge of near-ground wind conditions around airports is critical to the continued safe functioning and expansion of the aviation sector.

LiDAR/SoDAR technologies combined with mathematical modelling are currently two approaches favoured by the aviation sector. However, there has not been widespread take-up of either approach. In point of fact, the ICAO, Annex 3, [64:5-3] states ‘... turbulence and, to a large extent, wind shear are elements which, for the time being, cannot be satisfactorily observed from the ground and for which in most cases aircraft observations represent the only available evidence.’ Pilots report turbulence with the qualifying terms “moderate”, “strong” or “severe”, based on their subjective assessment of the intensity.

In response to this issue, DIT researchers have developed the world’s first truly three-dimensional anemometer – Urchin - that can record data at a frequency of 100Hz producing 64,000 data points a second. This provides a detailed view of the wind never seen before and a unique ability to measure turbulence. In joint Met Éireann/DIT Wind Trials during 2015 an Urchin was installed at Baldonnell aerodrome. This facilitated the comparison of Urchin data to a WMO certified installation.

Based on unique data from the Urchin project, researchers have developed the Area-Volume Metric (AVM) for turbulence. Analysis of the data from Baldonnell aerodrome showed that the recorded spikes in the AVM corresponded exactly in time to the diversion of aircraft from Irish to UK airports. However, the team were also able to observe quieter times during the storm where we think planes could have landed. Standard instrumentation showed turbulence all day whereas with our new system we were able to detect the spikes and quiet times. Aviation Report it stated that there was a severe wind warning in place at 17.15 on the 17th Nov 2015. This correlates exactly with the measurements for the Urchin but is not picked up by the cup anemometer. In addition the Urchin picks up severe turbulence at the runway that is not recorded in the aviation reports. This demonstrates that the Urchin can provide a superior indication of landing conditions leading to greater safety for passengers.

1 https://www.allianz.com/v_1417617209000/media/press/document/other/AGCS-Global-Aviation-Safety-Study-2014.pdf