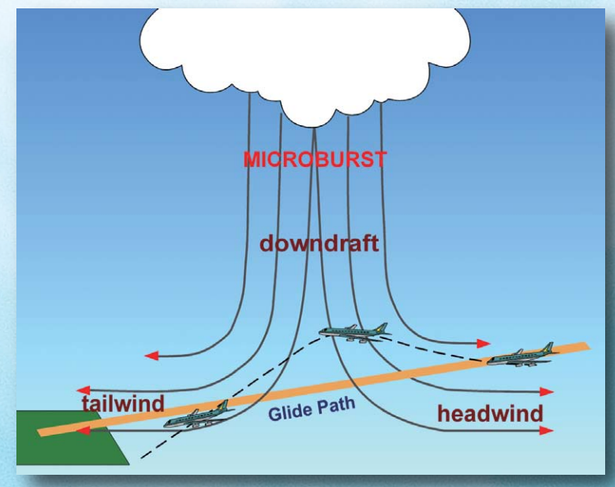
香港天文台
HONG KONG OBSERVATORY

I·F·A·L·P·A
THE GLOBAL VOICE OF PILOTS

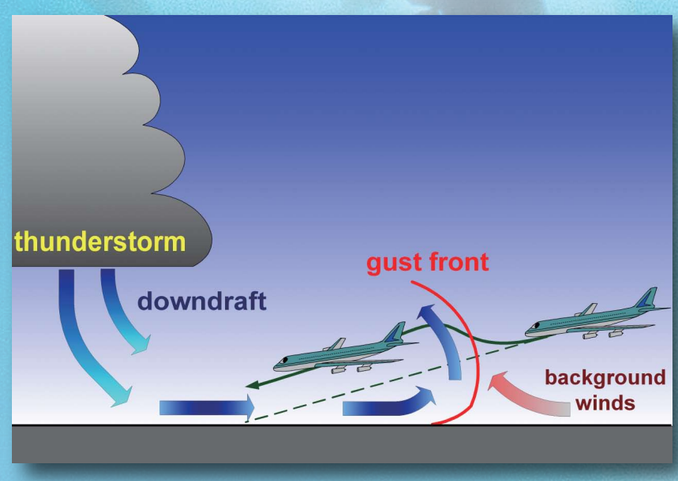
WIND SHEAR - THEIR CAUSES

MICROBURST



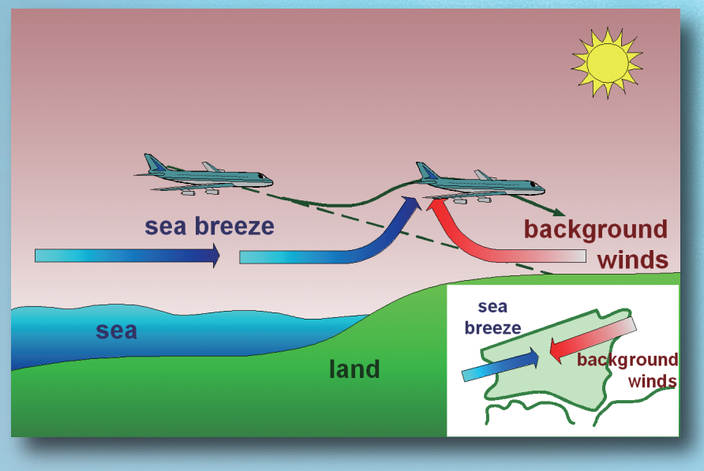
MICROBURST is the most violent form of wind shear brought by thunderstorms. A typical sequence of events associated with the microburst is headwind gain followed by downdraft and headwind loss, leading to loss of lift and sinking of aircraft. PILOTS SHOULD BE PREPARED TO **GO AROUND** to avoid penetrating the microburst. Pilots should also be aware that microburst could be asymmetrical and thus the sequence of events may appear different.

GUST FRONT



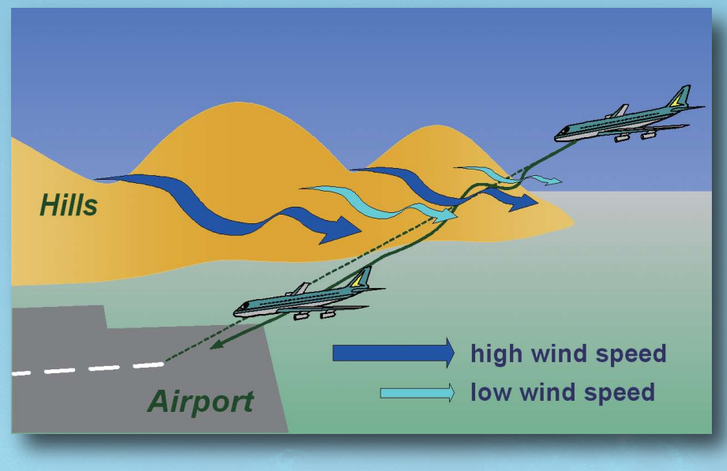
GUST FRONT is the leading edge of the cool air outflow from a thunderstorm after the downdraft reaches the ground and spreads out. Aircraft flying across a gust front may encounter increased headwind and lift. PILOTS SHOULD BE PREPARED TO **GO AROUND** in the event of landing long under such situation, especially on wet runway.

SEA BREEZE



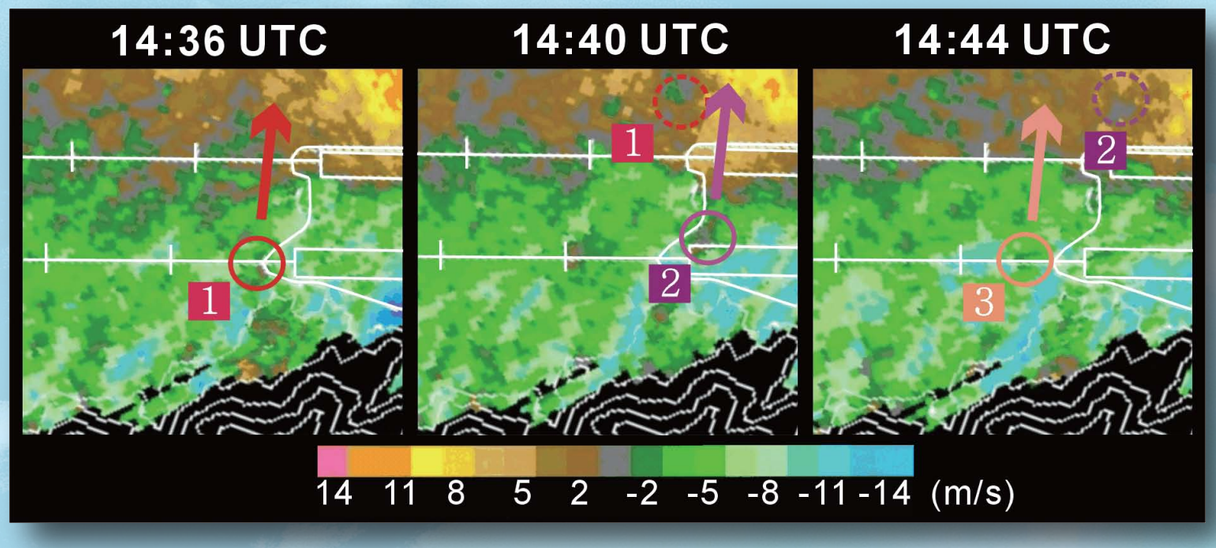
SEA BREEZE usually develops under fine weather and light wind conditions, but could bring significant wind shear if sea breeze opposes the prevailing flow, as in the case illustrated in the inset. Pilots should be prepared to encounter an increase of headwind and lift under such situation, but in a few occasions, headwind loss could also occur.

FLOW PAST TERRAIN



FLOW PAST TERRAIN could bring significant wind shear in the downwind areas under strong wind conditions such as the passage of tropical cyclone and in the strong monsoon. In mountainous areas and stable atmosphere (e.g. with low-level temperature inversion or over very cold ground surface), wind shear could occur in weaker winds. An example is strong gap flow arising from channeling effects by valleys in the Alpine region. Pilots should be prepared to encounter both headwind loss and gain when traversing terrain-induced wind shear.

TRANSIENT AND SPORADIC NATURE OF WIND SHEAR



The transient and sporadic nature of small-scale wind shear and turbulence is vividly revealed by the images of a Doppler LIght Detection and Ranging (LIDAR) system (left)* - under a strong southerly airflow blowing across high terrain to the south of the airport, small-scale features are observed to emerge from the terrain and, in a space of a few minutes, moved quickly across the runway corridors and dissipated. Aircraft traversing these small-scale features would encounter a sequence of headwind changes. Headwind loss and gain may be encountered.

**In the LIDAR images, the cool/warm colours represent winds towards/away from the LIDAR (see scale at the bottom). The arrows indicate the movement of the wind shear features marked by circles within the subsequent 4 minutes.*

World Meteorological Organization

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