FIJI AERONAUTICAL INFORMATION CIRCULAR

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GEN

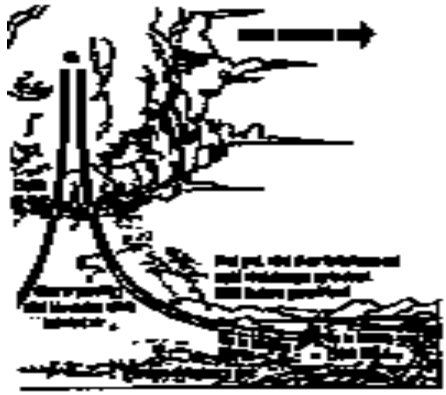
WIND SHEAR

Wind shear is a change in wind speed and/or direction over a short distance, either horizontal or vertical. It has been cited as a cause or contributing factor in a number of major aircraft accidents. Wind shear can occur at any altitude and its conditions are normally associated with one or more of the following phenomena:

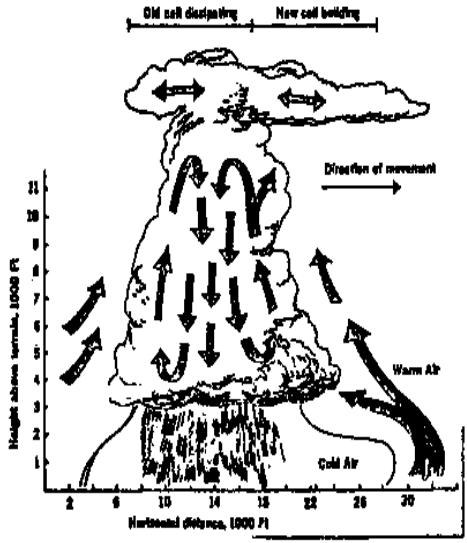
- thunderstorms
- sea breeze fronts
- strong surface winds coupled with local topography
- cold and warm fronts
- mountain waves
- low-level temperature inversions.

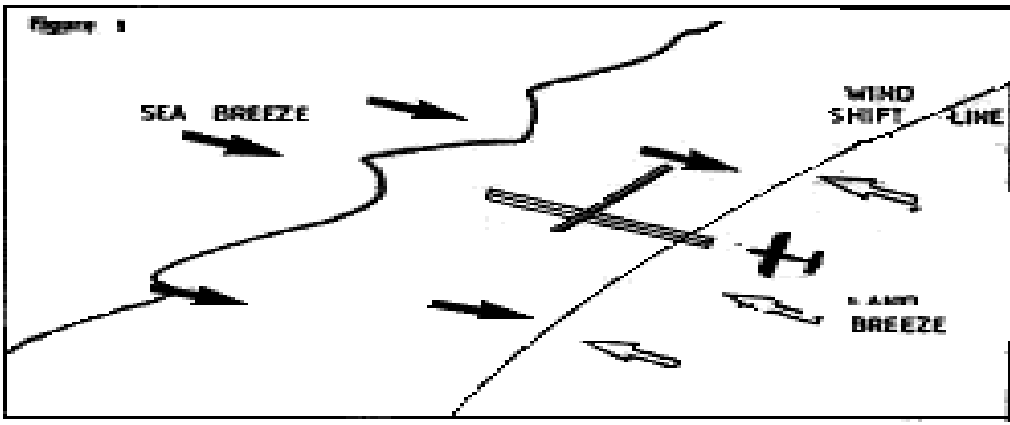
In Fiji, thunderstorms occur frequently during the hotter months from November to April. The violence of these storms and their winds are well documented. (See FIGS. 1 & 2).

Wind shears from sea breeze fronts occur regularly in the late mornings due to transitional wind change from land breeze to sea breeze as the land mass gets warmer than the sea. (FIG. 3)

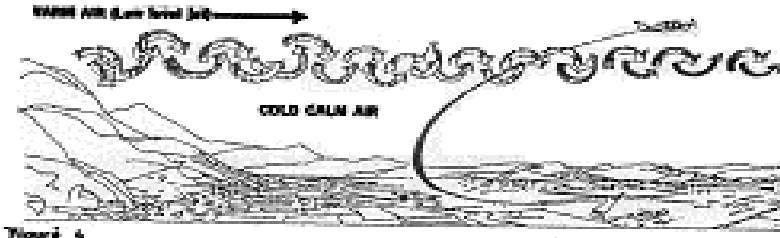


Topographical features like mountain ranges/passes, tall trees (e.g. coconut palms), large hangars/buildings near the runways and approaches will cause wind shears in strong wind conditions. (FIG. 4)

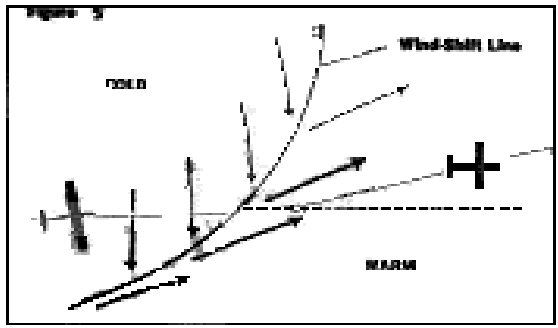




SEA BREEZE / LAND BREEZE



TOPOGRAPHIC AL AFFECTS



COLD/ WARM FRONTS

Effects of Wind Shear

The effect of wind shear on aircraft performance is most serious during the approach and take-off phase when the aircraft is flown at relatively low speed close to the surface. Any change in wind velocity can drastically alter the equilibrium of lift, indicated airspeed (IAS) and thrust requirements of an aircraft flying at its most critical performance envelope. The problem is compounded if an aircraft, in passing through a horizontal wind shear, enters an area of down draught or vertical sheer.

Take-off

If wind shear conditions are known to exist in the proximity of the climb-out path, take-off should be delayed until conditions become more favourable. If it is considered that a safe take-off can be made when wind shear conditions are suspected, extra precaution should be made:

- use reduced take-off weight where possible.
- use the longest available into-wind runway;
- plan to climb-out to avoid likely areas of wind shear;

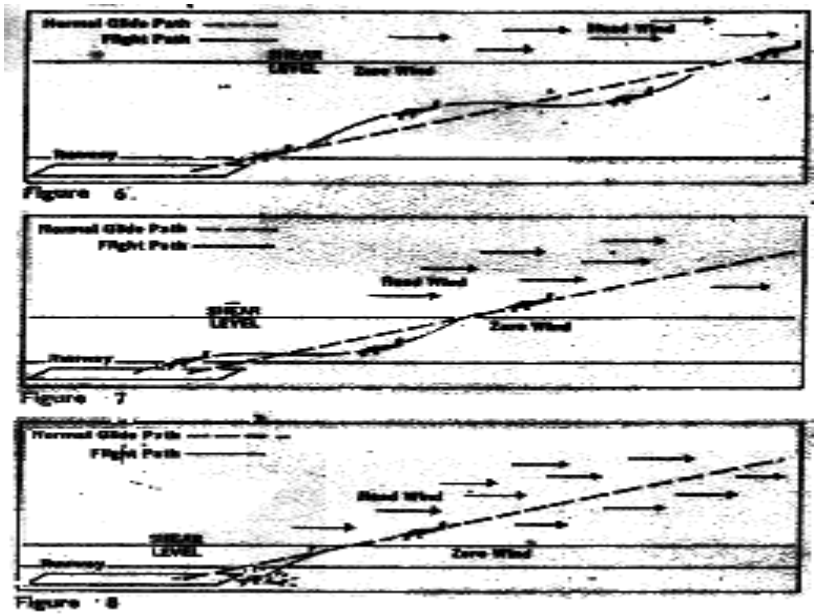
- use higher than normal speeds to counteract any possible down-draughts or sudden loss of headwind during the climb-out.

Landing

In a matter of seconds, wind shear can change a normal approach into a hazardous one, which requires an immediate emergency recovery by the pilot to avoid an aircraft accident.

An aircraft established on an approach encounters wind shear resulting from a decreasing headwind. The result is a transient loss of airspeed and lift, causing the aircraft to descend more rapidly than expected, and the pilot must compensate accordingly. The critical factor is whether there is sufficient altitude to complete a recovery. Figures 6,7,8 illustrate the resultant effects of wind shears occurring at the critical stage of an approach. Figure 8 depicts the most serious case where the altitude of a wind shear encounter is too low to effect a recovery or the shear itself is sufficiently strong to overcome the aircraft performance.

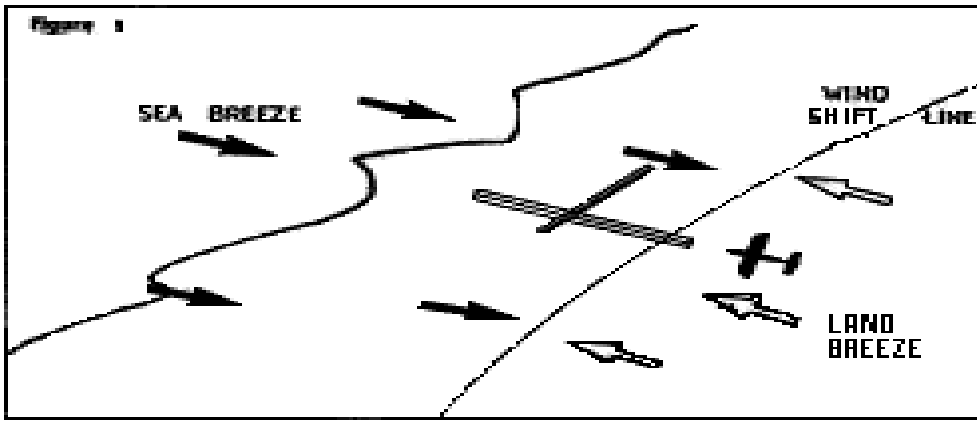
A decreasing tailwind has the opposite effect. In transiting the shear plane, the aircraft loses the tailwind; lift increases and the aircraft climbs above the glide path. As in the headwind case, the pilot's reaction can mean an over-correction, which leads to a transition from above to below glide path and insufficient altitude for the recovery (FIG.7).



Conclusion

The aim of this circular is to remind pilots of the hazards of wind shear on aircraft performance during take-off and landing. The best way a pilot can minimise its effects and cope with a wind shear is to: -

- Be aware of the nature and dangers of wind shears
- Anticipate the severity of shear from forecast and reported conditions.
- Be prepared to correct or go around.



SEA BREEZE / LAND BREEZE