

P-2010
DISCUSS THE DANGERS OF WIND AND THUNDERSTORMS

CONDITIONS

You are a Mission Observer trainee and must discuss effects and dangers of wind and thunderstorms.

OBJECTIVES

Discuss effects and dangers of wind and thunderstorms.

TRAINING AND EVALUATION

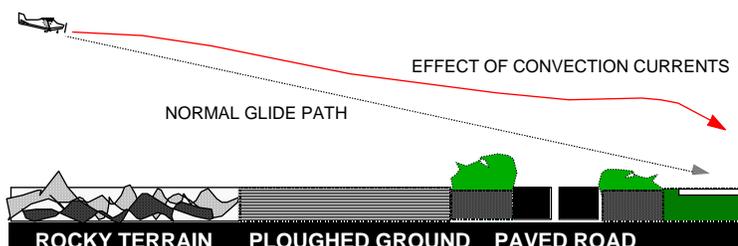
Training Outline

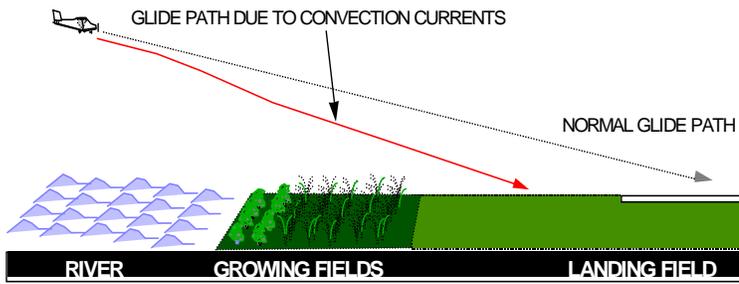
1. As a Mission Observer trainee, knowing the effects and dangers of winds and thunderstorms is essential.
2. Winds around pressure systems. Certain wind patterns can be associated with areas of high and low pressure: air flows from an area of high pressure to an area of low pressure. In the Northern Hemisphere during this flow the air is deflected to the right because of the rotation of the earth. Therefore, as the air leaves the high-pressure area, it is deflected to produce a clockwise circulation. As the air flows toward a low-pressure area, it is deflected to produce a counterclockwise flow around the low-pressure area.

Another important aspect is air moving out of a high-pressure area depletes the quantity of air. Therefore, highs are areas of descending air. Descending air favors dissipation of cloudiness; hence the association that high pressure usually portends good weather. By similar reasoning, when air converges into a low-pressure area, it cannot go outward against the pressure gradient, nor can it go downward into the ground; it must go upward. Rising air is conducive to cloudiness and precipitation; thus the general association low pressure — bad weather.

3. Convection currents. Certain kinds of surfaces are more effective than others at heating the air directly above them. Plowed ground, sand, rocks, and barren land give off a great deal of heat, whereas water and vegetation tend to absorb and retain heat. The uneven heating of the air causes small local circulation called “convection currents”, which are similar to the general circulation just described. Convection currents cause the bumpiness experienced by aircrews flying at low altitudes in warmer weather. On a low flight over varying surfaces, the crew will encounter updrafts over pavement or barren places and down drafts over vegetation or water. Ordinarily this can be avoided by flight at higher altitudes, so aircrews may need to climb periodically to take a break from the rough air at search altitudes.

Convection currents also cause difficulty in making landings, since they affect the rate of descent. The figures below show what happens to an aircraft on a landing approach over two different terrain types. The pilot must constantly correct for these affects during the final approach to the airport.





4. Cold and warm fronts. Certain characteristics of frontal activities will affect search effectiveness (primarily visibility and turbulence). For the aircrew, these factors must be considered during mission planning.

Characteristics of a cold, unstable air mass are:

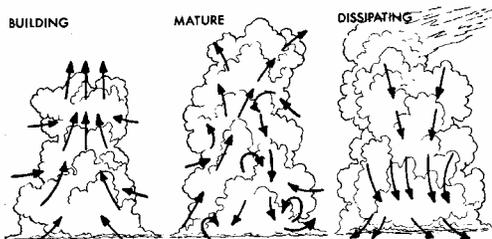
- Cumulus and cumulonimbus clouds
- Unlimited ceilings (except during precipitation)
- Excellent visibility (except during precipitation)
- Unstable air resulting in pronounced turbulence in lower levels (because of convection currents)
- Occasional local thunderstorms or showers - hail sleet, snow flurries

Characteristics of a warm, stable air mass are:

- Stratus and stratocumulus clouds
- Generally low ceilings
- Poor visibility (fog, haze, smoke, and dust held in lower levels)
- Smooth, stable air with little or no turbulence
- Slow steady precipitation or drizzle

5. Windshear. Windshear is best described as a change in wind direction and/or speed within a very short distance in the atmosphere. Under certain conditions, the atmosphere is capable of producing some dramatic shears very close to the ground; for example, wind direction changes of 180° and speed changes of 50 knots or more within 200 ft. of the ground have been observed. This, however, is unusual. Turbulence may or may not exist in wind shear conditions. If the surface wind under the front is strong and gusty there will be some turbulence associated with wind shear.

6. Thunderstorms. A thunderstorm is any storm accompanied by thunder and lighting. It usually includes some form of precipitation, and can cause trouble for aircraft in many forms: turbulence, icing, poor visibility, hail, wind shear, microbursts, lightning, and, in severe cases, tornadoes. No thunderstorm should ever be taken lightly. During the cumulus stage, vertical growth occurs so quickly that climbing over the developing thunderstorm is not possible. Flight beneath a thunderstorm, especially in the mature stage, is considered very foolish, due to the violent down drafts and turbulence beneath them. Flight around them may be a possibility, but can still be dangerous. Even though the aircraft may be in clear air, it may encounter hail, lightning, or turbulence a significant distance from the storm's core. *Thunderstorms should be avoided by at least 20 miles laterally.* The safest alternative, when confronted by thunderstorms, is to land, tie the aircraft down, and wait for the storms to dissipate or move on.



Additional Information

More detailed information on this topic is available in Chapter 6 of the MART.

Evaluation Preparation

Setup: None.

Brief Student: You are an Observer trainee asked to discuss the dangers of winds and thunderstorms.

Evaluation

<u>Performance measures</u>	<u>Results</u>
1. Discuss the effects of convection currents, particularly during landing.	P F
2. Discuss wind patterns around high- and low-pressure areas.	P F
3. Discuss the characteristics of cold and warm fronts.	P F
4. Discuss the dangers of windshear.	P F
5. Discuss the dangers of thunderstorms.	P F

Student must receive a pass on all performance measures to qualify in this task. If the individual fails any measure, show what was done wrong and how to do it correctly.