K Index	Thunderstorm Probability (%)
< 15	near 0
15 to 20	20
21 to 25	20 to 40
26 to 30	40 to 60
31 to 35	60 to 80
36 to 40	80 to 90
> 40	near 100

Figure 9-18. *K-Index (KI) versus probability of thunderstorm occurrence.*

Thunderstorms have several hazards, including turbulence, strong updrafts and downdrafts, strong shifting surface winds, hail, icing, poor visibility and/or low ceilings, lightning, and even tornadoes. Once a cloud has grown to be a Cb, hazards are possible, whether or not there are obvious signs. Since thermal soaring weather can rapidly deteriorate into thunderstorm weather, recognition of each hazard is important. Knowledge of the many hazards may inspire the pilot to land and secure the glider when early signs of thunderstorm activity appear—the safest solution.

Moderate turbulence is common within several miles of a thunderstorm, and it should be expected. Severe or even extreme turbulence (leading to possible structural failure) can occur anywhere within the thunderstorm itself. The inside of a thunderstorm is no place for glider pilots of any experience level. Outside of the storm, severe turbulence is common. One region of expected turbulence is near the surface gust front as cool outflow spreads from the storm. Violent updrafts can be followed a second or two later by violent downdrafts, with occasional side gusts adding to the excitement—not a pleasant proposition while in the landing pattern. At somewhat higher altitudes, but below the base of the Cb, moderate to severe turbulence can also be found along the boundary between the cool outflow and warm air feeding the Cb. Unpredictable smaller scale turbulent gusts can occur anywhere near a thunderstorm, so recognizing and avoiding the gust front does not mean safety from severe turbulence.

Large and strong updrafts and downdrafts accompany thunderstorms in the mature stage. Updrafts under the Cb base feeding into the cloud can easily exceed 1,000 fpm. Near the cloud base, the distance to the edge of the cloud can be deceptive; trying to avoid being inhaled into the cloud by strong updrafts can be difficult. In the later cumulus and early mature stage, updrafts feeding the cloud can cover many square miles. As the storm enters its mature stage, strong downdrafts, called downbursts or microbursts, can be encountered, even without very heavy precipitation present. Downbursts can also cover many square miles with descending air of 2,000 fpm or more. A pilot unlucky enough to fly under a forming downburst, which may not be visible, could encounter sink of 2,000 or 3,000 fpm, possibly greater in extreme cases. If such a downburst is encountered at pattern altitude, it can cut the normal time available to the pilot for planning the approach. For instance, a normal 3-minute pattern from 800 feet AGL to the ground happens in a mere 19 seconds in 2,500 fpm sink!

When a downburst or microburst hits the ground, the downdraft spreads out, leading to the strong surface winds, known as thunderstorm outflow. Typically, the winds strike quickly and give little warning of their approach. While soaring, pilots should keep a sharp lookout between the storm and the intended landing spot for signs of a wind shift. Blowing dust, smoke, or wind streaks on a lake indicating wind from the storm are clues that a gust front is rapidly approaching. Thunderstorm outflow winds are usually at speeds of 20 to 40 knots for a period of 5 to 10 minutes before diminishing. However, winds can easily exceed 60 knots, and in some cases, with a slow-moving thunderstorm, strong winds can last substantially longer. Although damaging outflow winds usually do not extend more than 5 or 10 miles from the Cb, winds of 20 or 30 knots can extend 50 miles or more from large thunderstorms.

Hail is possible with any thunderstorm and can exist as part of the main rain shaft. Hail can also occur many miles from the main rain shaft, especially under the thunderstorm anvil. Pea-sized hail usually does not damage a glider, but the large hail associated with a severe storm can dent metal gliders or damage the gelcoat on composite gliders, whether on the ground or in the air.

Icing is usually a problem only within a cloud, especially at levels where the outside temperature is approximately −10 °C. Under these conditions, supercooled water droplets (water existing in a liquid state 0 °C and below) can rapidly freeze upon contact with wings and other surfaces. At the beginning of the mature stage, early precipitation below cloud base may be difficult to see. At times, precipitation can even be falling through an updraft feeding the cloud. Snow, graupel, or ice pellets falling from the forming storm above can stick to the leading edge of the wing, causing degradation in performance. Rain on the wings can be a problem since some airfoils can be adversely affected by water.

Poor visibility due to precipitation and possible low ceilings as the air below the thunderstorm is cooled is yet another concern. Even light or moderate precipitation can reduce visibility dramatically. Often, under a precipitating Cb, there is no distinction between precipitation and actual cloud.

Lightning in a thunderstorm occurs in cloud, cloud to cloud (in the case of other nearby storms, such as a multicell storm), or cloud to ground. Lightning strikes are completely