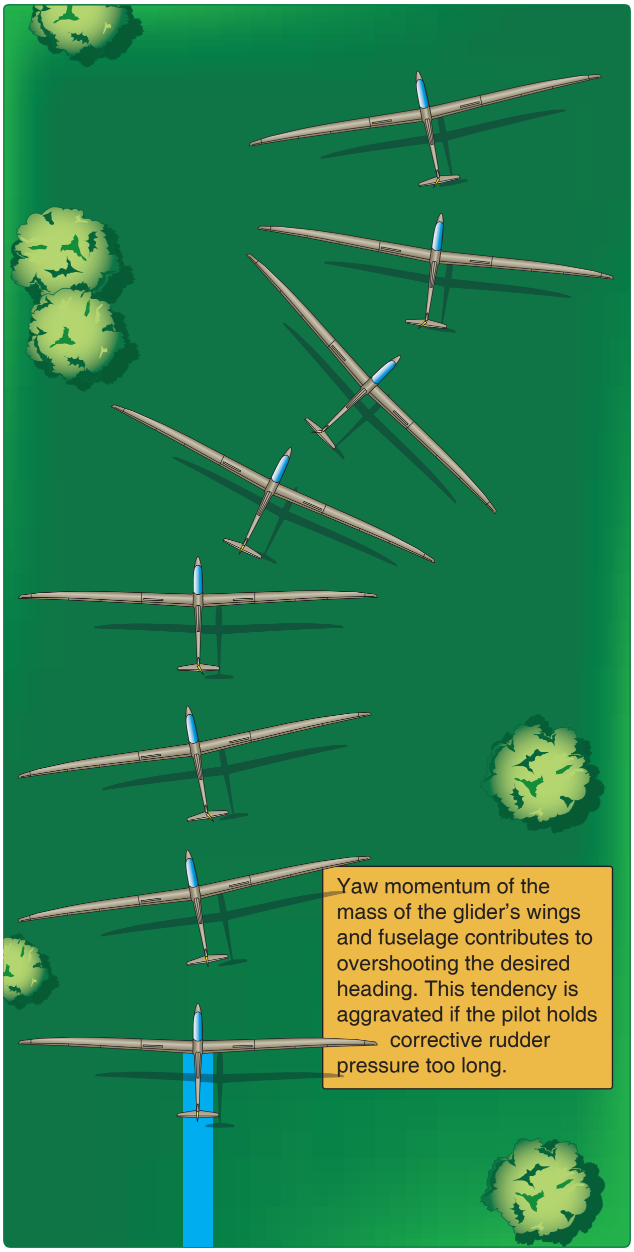

Figure 8-3. *Pilot-induced yaw oscillations during takeoff roll.*

during the early portion of the takeoff roll and during the latter portion of the landing rollout. Even highly proficient glider pilots find takeoffs and landings in these gliders to be challenging. Many of these gliders are designed for racing or cross-country flights and have provisions for adding water ballast to the wings. Adding ballast increases mass, which results in an increase in lag time.

Low time pilots and pilots new to such high performance gliders should review the GFM/POH thoroughly prior to flight. It is also recommended to review normal procedures, emergency procedures, and the glider's fight characteristics with a qualified pilot or instructor pilot before attempting flight in any high performance glider.

Gust-Induced Oscillations

Gusty headwinds can induce pitch oscillations because the effectiveness of the elevator varies due to changes in the speed of the airflow over the elevator. Crosswinds also can induce yaw and roll oscillations. In gusty crosswinds, the effects on glider control change rapidly depending on the speed and rate of the crosswind component. A crosswind from the right, for instance, tends to weathervane the glider into the wind, causing an uncommanded yaw to the right. Crosswinds tend to lift the upwind wing of the glider and push the tail downwind.

Local terrain can have a considerable effect on the wind. Wind blowing over and around obstacles can be gusty and chaotic. Nearby obstacles, such as hangars, groves or lines of trees, hills, and ridges can have a pronounced effect on low altitude winds, particularly on the downwind side of the obstruction. In general, the effect of an upwind obstacle is to induce additional turbulence and gustiness in the wind. These conditions are usually found from the surface to an altitude of 300 feet or more. If flight in these conditions cannot be avoided, the general rule during takeoff is to achieve a faster-than-normal speed prior to lift-off.

The additional speed increases the responsiveness of the controls and simplifies the problem of correcting for turbulence and gusts. This provides a measure of protection against PIOs. The additional speed also provides a safer margin above stall airspeed. This is very desirable on gusty days because variations in the headwind component have a considerable effect on indicated airspeed.

Caution: Do not exceed the glider's tow speed limitations when adding safety speed margins for takeoff in windy conditions.

Vertical Gusts During High-Speed Cruise

Although PIOs occur most commonly during launch, they can occur during cruising flight, even when cruising at high speed. Turbulence usually plays a role in this type of PIO, as does the elasticity and flexibility of the glider structure. An example is an encounter with an abrupt updraft during wings-level high-speed cruise. The upward-blowing gust increases the angle of attack of the wings, which bend upward very quickly, storing elastic energy in the wing spars. For a moment, the G-loading in the cabin is significantly greater than one G. Like a compressed coil spring seeking release, the wing spars reflex downward, lofting the fuselage higher. When the fuselage reaches the top of this motion, the wing spars are storing elastic energy in the downward direction, and the fuselage is sprung downward in response to the release of elastic energy in the wing spars. The pilot then experiences reduced G-load, accompanied perhaps by a head bang against