Soaring Achievements

Performance Penalty: Speed

Narrator:
Particularly with a following wind, gliders like the Rhönsperber could go a very long way. But a downwind journey meant that the glider needed to be retrieved. To avoid long road journeys the Rhönsperber would have to make progress into a headwind to return. That means flying faster, and faster flying makes the performance much worse. We can demonstrate the performance penalty associated with speed in a special test flight. For a relatively small glide angle you can assume that the horizontal speed is the same as the air speed, and the air speed is easy to measure, being one of the instrument displays.

Ian Johnston:
I'm flying the glider now at about 50 knots, the vertical speed of about 1½ knots down. That gives us a glide angle of about 30:1. If I now increase the speed – we are now doing 80 knots and the vertical speed is around 4 knots – so at 80 knots my glide angle gets worse, and I'm only doing about 20:1.

Narrator:
You can plot the performance of that test flight in terms of the relationship between horizontal and vertical speeds. At 50 knots the glider's vertical speed is about minus 1½ knots, and at 80 knots the vertical speed becomes minus 4 knots. Other air speeds carry different speeds of descent, giving this performance graph which is known as a polar curve. The highest point on the graph gives you the minimum sink speed for this glider, that's around 40 knots. It's the speed at which it should fly in thermals, or other rising air, to gain height as quickly as possible. The tangent from the origin to the curve touches the curve at the point with the lowest possible ratio of vertical to horizontal speed. The airspeed at this point is called the 'Best Glide' speed and it's generally slightly higher than the minimum sink speed. Now the Rhönsperber performs well in a very narrow range of speeds. Fly at speeds much greater than 40 knots and the Rhönsperber effectively drops out of the sky.