How to Set-up and Use Your Glide Slope Ruler

The following information will explain how to complete your Glide Slope Ruler and the fundamentals of Glide Slope Management. This is an excerpt from Chapter 15, *Glider Pilot's Handbook of Aeronautical Knowledge,* by Russell Holtz, available at **www.GLIDERBOOKS.com**.

GLIDE SLOPE MANAGEMENT

The question that a cross-country pilot must be able to answer at all times is, "Can I glide to a safe landing zone from this altitude?" With proper glide slope management, the answer to that question should never be in doubt.

Modern flight computers can perform the functions necessary for glide slope management for you. However, even if you use a computer, you should know the concepts presented here, so that you understand what your computer is doing. You should be able to take over this function if the computer fails.

Safety Factor

When calculating glide distances for cross-country flying, you should reduce the expected glide ratio by a safety factor to ensure that unexpected sink or lower than expected performance of the glider (or pilot!) does not keep you from safely reaching your goal. As a beginner, you should use only 50% of the published glide ratio. As you become more comfortable and proficient, you may be able to count on up to 75% of the published glide ratio.

The Glide Slope Ruler

A glide slope ruler is a simple device for determining how much altitude you need to cover a given distance. It allows you to quickly determine whether you are within the safe glide zone of an airport. The ruler accounts for the safety factor and for headwinds that you may encounter.

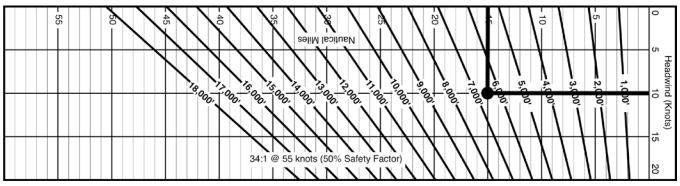

Figure 1 *– Example of a glide slope ruler (not to scale). The ruler shows that to fly 15 miles into a 10-knot headwind, you would need 6,500 feet of altitude.*

Notice that the shorter axis indicates headwind in 5-knot increments, and the longer axis indicates distance in nautical miles. The diagonal lines indicate the altitude needed to cover a distance given a particular headwind.

For example, if you need to fly a distance of 15 nautical miles into a 10-knot headwind, you would need about 6,500 feet of altitude. To get the indicated altitude, however, you must also add the pattern altitude and airport elevation.

USING A GLIDE SLOPE RULER

You can use the ruler to determine the safe glide altitude right on a sectional, without having to do any math in your head. Place the ruler so that the altitude that you want to arrive at is adjacent to the airport symbol. Suppose you are over the dam to the northwest of Kody Field, as shown in Figure 2.

COMPLETING YOUR GLIDE SLOPE RULER

Determine the best glide ratio for your glider, either from the polar or from the glider's manual. Enter this value in the following table.

	Glide Ratio		Safety Factor		Modified Glide Ratio
No Headwind		X		=	
20 knot Headwind		X		=	

Determine the glide ratio into a 20 knot headwind, either from the polar, or by subtracting 20 knots from the best glide speed then dividing by the best glide sink rate. Make sure you adjust the best glide speed for your particular gross weight. (You will need to make a separate glide slope ruler for when you carry ballast.) Enter this value in the table.

Decide what safety factor you want to apply to the glide ratios. (If you are just starting to fly cross-country, a factor of 0.5 is recommended. You can raise this as you gain experience.) Enter this value in the table.

Multiply the glide ratios by the safety factor to determine the modified glide ratios.

To determine how far you can glide from different altitudes, multiply the modified glide ratios by the altitude, then divide by 6,076 (the number of feet in one nautical mile). Do this for each altitude in the following table.

Altitude	No Headwind	20 knot Headwind	Altitude	No Headwind	20 knot Headwind
1,000′			10,000′		
2,000′			11,000′		
3,000′			12,000′		
4,000′			13,000′		
5,000′			14,000′		
6,000′			15,000′		
7,000′			16,000′		
8,000′			17,000′		
9,000′			18,000′		

Plot each of the pairs of distance-altitude values on the ruler (one pair for no headwind, one pair for a 20-knot headwind), connect them with a line, and label the line with the altitude. Also, label the ruler with the type of glider, gross weight, and the safety factor used. Your ruler should appear similar to the one in Figure 1.

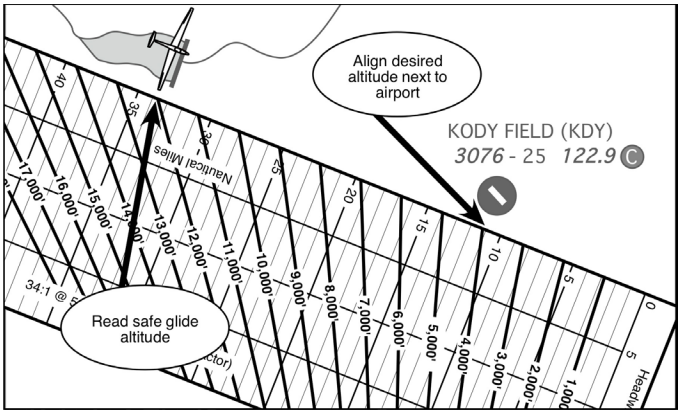

Figure 2 *– To use the glide slope ruler, align the required arrival altitude with the airport, and read off the safe glide altitude corresponding to the glider's position.*

The elevation of the field is 3,076 feet, so you will want to arrive at the field at about 4,000 feet to give yourself about 1,000 feet for a pattern. You therefore align the 4,000-foot mark with the airport symbol. Now read off the indicated altitude that you would need to safely reach the airport. In this case, it is 12,000 feet.

If there is wind, you use the axis that corresponds to the headwind component. For example, if you also had to consider a 10-knot headwind, you would set up the glide slope ruler as shown in Figure 3.

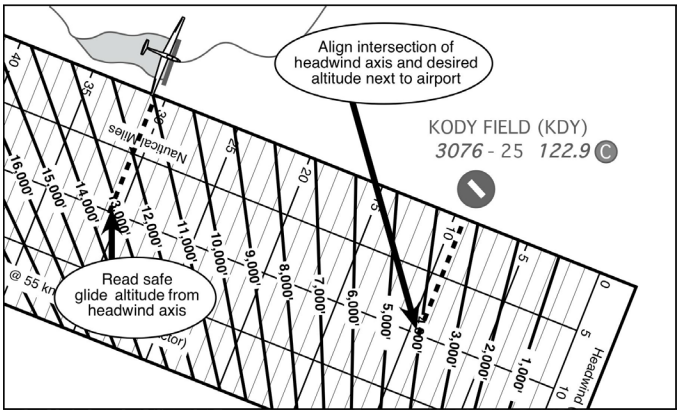

Figure 3 *– To use the glide slope ruler when there is a 10-knot headwind, align the intersection of the required arrival altitude line and the 10-knot headwind line with the airport, and read off the safe glide altitude corresponding to the glider's position from the 10-knot axis.*

In this case, you align the intersection of the 4,000-foot altitude line and the 10-knot headwind line with the airport (as shown by the heavy dotted line). You can then read off the safe glide altitude from the 10-knot axis (again, shown by a heavy dotted line), which in this case would be about 13,500 feet.

Safe Glide Circles

While the glide slope ruler makes it relatively easy to determine how much altitude you need to safely glide to an airport, if you draw safe glide circles on your sectional, it will be even easier. For example, in Figure 4, safe glide circles have been drawn around Kody Field at 2,000-foot intervals.

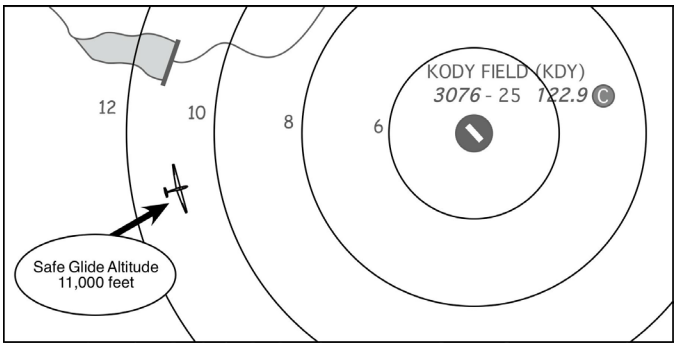

Figure 4 *– Safe glide circles greatly simplify glide slope management.*

If you were located where the glider is shown, you would need 11,000 feet indicated to make it to the field with an altitude of 4,000 feet, which would allow you 1,000 feet for a pattern.

When laying out safe glide circles around multiple airports, what you want to know is whether you have enough altitude to make it to any airport. Therefore, you can leave out any arcs that are "redundant". For example, in Figure 5, the 12,000-foot arc for Kody Field is not shown where the glider is located, because the glider could make it to Dakota Airport with only 9,000 feet of altitude.

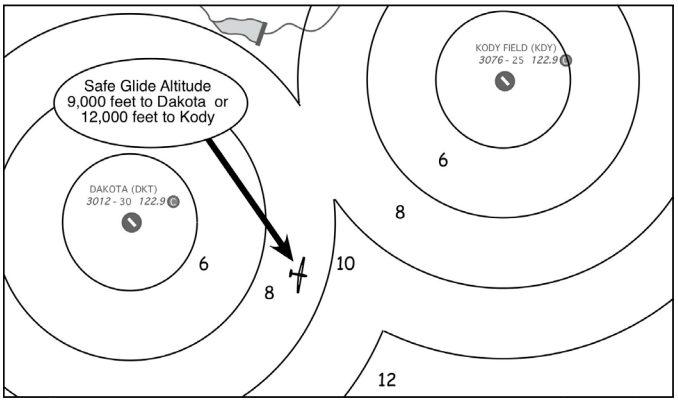

Figure 5 *– Safe glide circles for multiple airports*

Laying out safe glide circles in this manner keeps your sectional from becoming illegible. You can make the circles first with a compass and pencil, then go back over the non-redundant arcs with ink.

When planning a cross-country route, you will have a series of safe glide circles linked together. This makes it easy to determine what the minimum thermal height must be for you to complete the flight. For example, flying from Kody to Dakota will require a minimum altitude of 10,000 feet. If you can stay above 10,000 feet for the whole flight, you won't have to worry about making it to an airport. However, if you are only occasionally climbing above 10,000 feet, you must be careful to have at least 10,000 feet of altitude when you are halfway between the two airports.

When laying out safe glide circles, make sure there is no terrain that would keep you from reaching the airport. If your safe glide circle says you only need 5,000 feet to get to an airport, but there is a 6,000-foot mountain between you and that airport, you have a problem! If terrain is a factor along your route, you should plan to clear it by at least 1,000 feet.