SAILPLANE DERBY

SAILPLANE is an S-80 program for Level II 16K and up.

by David J.T. Nunn

The Sailplane Derby program is a 'True to Life' simulation of a cross-country sailplane race.

Competition gliding is carried out by enthusiasts in most countries of the world using sailplanes which are typically of 50-foot wingspan, constructed of fiberglass reinforced plastic with extensive streamlining and costing upward of $30,000. They are towed aloft by small, powered airplanes and released: from then on the pilots must rely on rising upcurrents of warm air called 'thermals' to stay aloft. Pilots guide their machines across country seeking the summer cumulus clouds that often mark the top of an active thermal and then turn in tight circles to stay within the confines of the narrow columns of rising air, enabling their sailplanes to be lifted upward. When all possible height has been gained (sometimes by entering the cloud capping the thermal), they dart off in search of the next active thermal on the course line.

In competition, the task is usually to fly from the take-off point, around two turning points and back home. This triangular task is timed; the pilot completing the task in the shortest time is the winner.

SAILPLANE PERFORMANCE

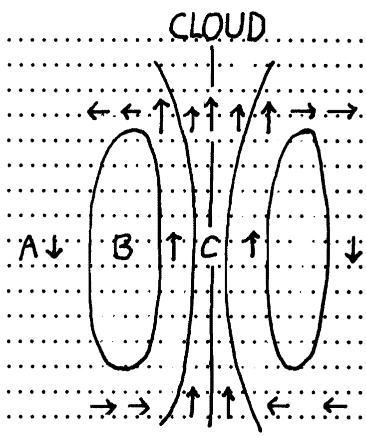
A sailplane's performance is usually specified as its maximum glide angle, typically 40 to 1 @ 50 mph: for every foot in height lost it glides forward 40 feet. However, if the sailplane flies faster, then the glide angle deteriorates due to increased aero-dynamic drag. (Flying slower than 50 mph worsens the glide angle.)

SPEED	40	50	60	70	80	90	100	110	120
G.ANGLE	23:1	40:1	34:1	30:1	26:1	24:1	21:1	19:1	18:1

The table above shows that flying at 50 mph will produce maximum glide distance. However, if the thermals are strong and you have sufficient altitude, then faster progress can be made at 60 to 80 mph without too large an altitude loss.

THERMAL STRUCTURE

The diagram shows a vertical cross section thru a typical thermal. The arrows indicate relative air movements. It will be seen that a sailplane entering the thermal at (A) will encounter strong sinking air; then at (B) neutral air and finally strong lifting air at (C). The shape of the thermal is sometimes called a 'vortex ring' — similar to the smoke rings produced by extrovert smokers!



CORRECT 'SPEED TO FLY'

When a sailplane flies through a sinking or rising air mass, its airspeed should be adjusted in accordance with the following general rule:

1. If the sailplane is in sinking air, its speed should be increased.
2. If in rising air, the speed should be decreased (usually to a minimum of 50 mph).

At first glance, this rule seems illogical. However, the reason is to ensure that, in the case of sink, the sailplane is subject to the sink effect for the minimum 'period of time', thus reducing the 'total' loss of height; and the converse for lifting air. It should be noted that the exact quantity of each speed adjustment can only be learned by experience, although mathematical treatments for the problem have been derived by several experts including Dr. Paul MacReady (lately of Man Powered Flight fame).

It may be necessary to increase the airspeed of the sailplane if you are attempting to 'penetrate' into a strong wind. Consider the table set out below:

SPEED	40	50	60	70	80	90	100	110	120
G.ANGLE	9:1	20:1	21:1	20:1	18:1	17:1	16:1	15:1	14:1

The table above shows the dramatic effect of glide angle (over the ground) of a sailplane heading directly into a 24 mph wind - the strongest the simulation is likely to inflict on you. You must remember that, although the angle through the air is still the same as shown in the first glide angle chart, the distance covered 'over the ground' is greatly reduced. You can also see that it pays to fly faster, say at 60 or 70 mph, to achieve maximum distance over the ground.