fective glide ratio of the sailplane can be increased by fast optimizing control. This can be considered a form of simple dynamic soaring. However, the magnitude of the effect is very small. An error of 5 mph, or even 10 mph, from the optimum speed makes surprisingly little difference in the effective glide ratio or average flight speed in thermal conditions. For example, with a Schweizer 1-23 in a 4 fps downcurrent in a 5 fps thermal situation, the net cross-country speed decreases only 2% if the pilot flies at 70 mph or 90 mph instead of the optimum 80 mph.

Horizontal gusts constitute a different situation. Here fast speed (altitude) control may be more beneficial, for it is the entering or leaving the new flow regime which is important, rather than the time in it. Because lift is a non-linear function of velocity, the sailplane obtains more energy as its airspeed is increased from the same original speed. Fast and accurate pilot control of optimum airspeed, perhaps aided by a "G" sensitive bob weight in the control system to emphasize G-forces, can thus presumably increase the effective sailplane performance — but the net effects would be small except under unusual circumstances of large variations in the horizontal and vertical motions of the air (see Reference 21).

The Future

With some practical, available, inexpensive instrument improvements, and with some careful practice a pilot could decrease his sink between thermals, have a better chance of locating the position of the next thermal from a distance, and with one pass through the thermal could estimate its future actions and select and return to its best part. In a typical flight the gains from these techniques might greatly exceed the performance differences between typical contest sailplanes.

The most vital instrument is a fast variometer with velocity change and drag corrections and with an optimum velocity unit. With this instrument, and with some training in maneuvers, big gains could be made. For further gains, but with more complex or new (but still practical) instrumentation, try adding a velocity recorder, presenting optimum speed automatically, installing a temperature buoyancy device. fitting on a bubble generator, adding a potential gradient "director," and devising water vapor gradient instrumentation. The infrared ground temperature instrument may prove economically feasible — and it offers such great promise that it should be emphasized. No doubt ohter aids will come to mind as this subject is studied further, and no doubt some of the exotic devices which now seem impractical will be developed to practicability for other purposes and then be available for soaring.

The pilot who pursues this subject can significantly advance soaring and meteorology, and may simultaneously get superglider performance out of his ordinary sailplane.

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