THE THERMAL INDEX

by HARRY C. HIGGINS

The Thermal Index (TI) provides a simple method for predicting the strength of dry thermals and the height to which they will rise. The TI utilizes classical thermal strength prediction techniques, but organizes the data such that two numbers provide the basic prediction for a single day. Because of their simplicity, TI's can be worked out for several stations rapidly, allowing rough maps of "iso-lifts" to guide the soaring pilot. Daily records of the TI indicate trends and provide an early clue to the approach of strong lift. If seasonal records of the TI were maintained, optimum locations for contests and record expeditions could be easily discovered and the planning of ideal routes would be simplified.

The thermal index is analogous to the "stability index" (SI) (described at the end of this article) except that the TI gives data on dry ground thermals which is not done by the SI. The TI is defined as the difference between the potential temperature at a given altitude and the potential temperature of the forecast surface high for the day. 850 and 700 millibar levels have been selected because of the availability of data and their significance to the soaring pilot. 850 is very nearly 5000 foot altitude above sea level and 700 is approximately 10,000 feet. The temperature at these and other altitudes is observed by radio balloon soundings (RAOBS) twice a day at statious approximately 300 miles apart in the continental U.S. Observations are made at 0000Z and 1200Z (6:00 P.M. CST and 6:00 A.M. CST) and are transmitted on the weather bureau teletype shortly after 8:00 A.M. CST.

The TI forecast is prepared as follows: Three numbers are taken from the RAOBS report: (1) the temperature at 850 mb, (2) the temperature at 700 mb, and (3) the station pressure in millibars. The prediction of the surface high is obtained from the most recent forecast. Since predicted temperatures usually indicate a band such as "75 to 80" or "the high 70's," a single averaged value is used. The three temperatures are then plotted on a "tephigram" or "pseudo-adiabatic" diagram as shown on figure 1 using station pressure to locate the proper altitude for the surface temperature. The surface forecast is extended to 700 mb along a dry adiabat. The temperature in degrees Centigrade (°C) where the dry adiabat intersects 850 mb is subtracted algebraically from the observed temperature in °C at that altitude and the difference is the 850 mb or 5000-foot Thermal Index.

Similarly, the temperature in °C where the dry adiabat originating at the surface intersects 700 mb is subtracted algebraically from the observed 700 mb temperature in °C to give the 700 mb Thermal Index.

Experience has shown that a TI of –3 or less indicates a very good chance for sailplanes reaching the altitude of the observation. Furthermore, the magnitude of the TI is

About the Author

Harry C. Higgins is an aerodynamicist for the Boeing Airplane Co. and he has been flying sailplanes off and on for 17 years. He earned the Gold altitude leg 10 years ago and made over a dozen more or less serious attempts at Gold distance during the past six years. This article was inspired by the fact that he earned Gold distance one week after organizing available data in the form of the Thermal Index. His hope is that the use of this parameter will enable the average pilot to predict how good a given day will be for serious soaring attempts.

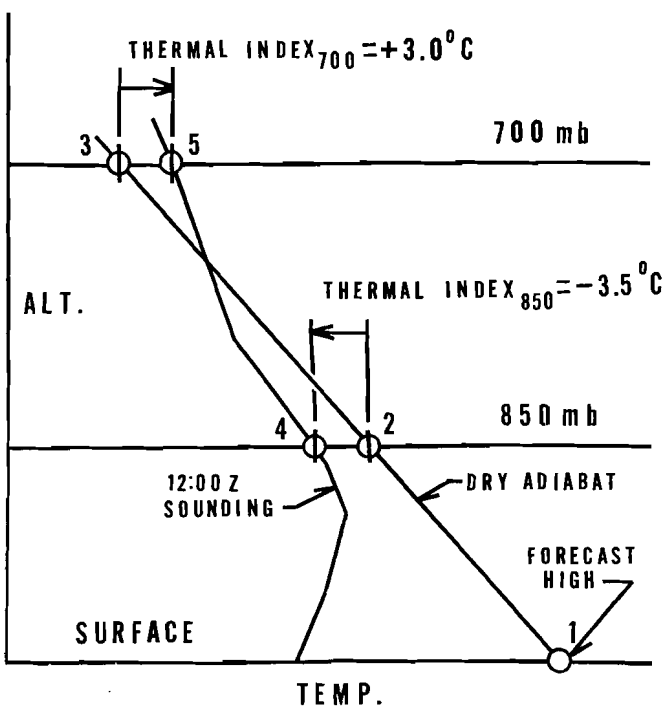

FIGURE 1

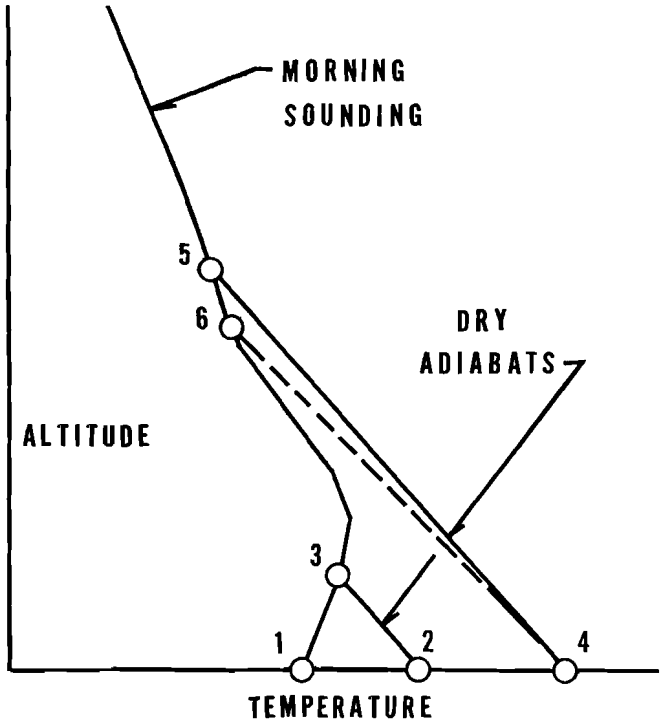

FIGURE 2