An Introduction TO SOARING

by Robert M. Stanley

PART III

The following is the third installment of an article on soaring written by Robert M. Stanley for the National Aeronautics Council. It is reprinted with their permission.—Editor.

The first form of soaring utilized the upward motion imparted to a wind blowing against a slope or hill, and was known as slope soaring. Given sufficient wind and favorable slopes, soaring is possible for hours on end and it is this early form of simple soaring which has fostered the prevalent mistaken idea that soaring flight is dependent upon windy, hilly terrain.

For a time, the mere exhiliration of remaining aloft in silent, romantic flight was enough. Before long, however, the more restless, more progressive pilots began to shake off the shackles of slope soaring and began short jumps from hill to hill, or following ridges to distant points. (Lewin Barringer's 1935 flight of 154 miles along the Blue Ridge is an outstanding example of the use of slope winds for distance soaring. Since the advent of thermal soaring, distances such as these become commonplace, but this remains today the longest flight ever made using wind alone.)

While considering slope soaring, it might be of interest to observe that no other form of soaring adapts itself so well to the endurance-minded pilot. Though this form of flag-pole sitting has gone out of favor in recent years, our national endurance record of 21 hours, 34 minutes was made in 1931 by Lt. Wm. Cocke in a flight above Honolulu's Pali. This famous cliff rises some 2,000 feet above the Pacific, and for months on end a steady trade wind blows squarely against it, lifting warm, moist, tropical air high enough for its vapor to condense, shrouding the cliff tops in a perpetual mantle of white clouds. For a time a world record, Cocke's flight could as well have continued for months but for pilot fatigue, since, given steady slope winds, only sheer monotony and physical exhaustion need cause a pilot to descend. The present world record exceeding 50 hours was made in a two-seat soaring plane.

When pilots had become adept at simple slope soaring, they began to notice unusual upward moving currents of air not related to the classic slope winds. Deducing that their origin resulted from heat radiation, they were termed "thermal currents" or thermals. These were found to exist beneath cumulus clouds, and possessed remarkable vigor. Timidly at first, then more boldly, pilots began to utilize these forces to divorce themselves from their slope soaring sites and perform distance flights irrespective of terrain. It is this technique which has been improved to such an extent that flights of three to four hundred miles are now frequently made, all without regard to topographical considerations of any kind.

To adequately comprehend the mechanics of thermal activity, we must study the meteorological structure of our atmosphere. With an increase of altitude, the atmosphere becomes colder, its pressure becomes lower. At 35,000 feet, the lower limit of the stratosphere, the temperature is —55 degree C, and the pressure is only a fraction of sea level pressure.

The author and Ernest Schweizer at the completion of their flight to Washington from Elmira

If air is expanded, due to any reason, it becomes buoyant, and drops in temperature. Heating will cause expansion, and hence a hot bubble of air will rise. As it rises, atmospheric pressure and temperature decrease, causing further expansion. If the air aloft happens to be colder than normal, the bubble of air will remain warmer than the surrounding air, and hence continue to rise. After it has expanded sufficiently to lower its temperature to its dew point, condensation will form, and the air bubble becomes a cloud. The mere act of condensation releases additional quantities of heat, so the process continues automatically. Thus with cold air aloft and warm sunshine heating up fields and forests, convection begins, sending up rapidly rising bubbles or fountains of air to give the wind not only a horizontal motion, but a vertical component as well. Thus on a hot summer day do we have light, variable winds with a canopy of fleecy white clouds above.

Normally this process is quite gentle and we have scattered clouds which form in the morning, disappearing and reforming, finally disappearing in late afternoon to leave a cloudless sky. Where the air aloft is abnormally cold, however, and the surface air moist, we have a much more violent phenomena known as the squall, also thunderheads. These constitute real storms, and possess an energy far greater than the simple, small cloud.

Frequently the surface air is too dry to give rise to cloud formation. When this occurs, the convection still may continue without visible evidence of its activity, resulting in what is known in soaring jargon as "dry thermals." These usually are more vigorous but harder to locate than the usual cloud forming variety. Yet despite their invisible nature, some very remarkable distance flights have been thus made under a cloudless sky. In 1939, Chester Decker made a 233-mile flight which was stopped only by the Atlantic Ocean on a day on which no clouds were observed. The presence or absence of clouds is not of itself an indication of the quality of