TECHNICAL PROGRESS

By AUGUST RASPET

Chairman, SSA Technical Committee

IN the United States those who are inclined toward the systematic development of knowledge, and that applied to soaring in particular, have arrived at a definition for soaring, namely: The science of extracting useful energy from the anomalous behavior of the motions of the air mass by means of a glider. Based on this definition the program of research has resolved itself into:

a. The study of micrometeorological air mass motions.

b. The development of techniques and instruments for utilizing the anomalies of the atmosphere.

c. The study of the properties of the sailplane possessing highest efficiency in extracting energy from the air mass motions.

d. The development of structures permitting high efficiency sailplanes to be built, techniques for launching them, and auxiliary apparatus necessary to efficient flight.

This report will attempt to convey the overall program in the United States. A bibliography of papers will be cited for those who wish to study the work in detail.

The highlight in the scientific aspects of soaring was the joint meeting of the Soaring Society of America and the Institute of Aeronautical Sciences on July 1, 1948, at Elmira, New York, during the 15th National Soaring Contest. The theme was the consideration of the ultimate performance sailplane. It was generally concluded by the contributors that for some time to come sailplanes will be designed for slow spiralling flight at low sinking speeds and high cross-country speed between thermals.

Laminar flow wings with flaps to improve speed range appeared worthy of test. The emphasis on extremely high aspect ratios appears for the most part, to have abated. However, great efforts on parasitic drag reduction were in favor. The application of boundary layer control as well as the reduction of drag, was seriously considered.

These joint conferences are planned as annual features of the National Soaring Contests.

A research project sponsored in part by the Office of Naval Research was conducted by the Aerophysics Institute, Inc., a non-profit organization devoted to research connected with soaring. The project aimed toward studying the nature of the airflow over a ridge under various ambient conditions.

A sailplane was used as a probe to determine the horizontal and vertical wind components. At the same time the temperature of the air mass was determined with a lag of one second or less. As a result, two types of waves were found in the flow—turbulence waves and the longer waves commonly called gravity waves. Theoretical studies by prior investigators had deduced that the wavelength of gravity waves were influenced only by the lapse rate. The results of the exploration by the Aerophysics Institute, however, showed that the wavelength increases with altitude at least to the stratosphere.

Concerning the sailplane as a tool of research in atmospheric flow, the Aerophysics Institute concludes that there is no substitute or equivalent for micrometeorological investigation in the altitude range up to the stratosphere. The confidence which that organization places on the sailplane is such that it is now planning the use of a group of twelve sailplanes, properly instrumented, to delineate as far as possible the secular variations in the flow fields under investigation.

The region in California near Bishop, at the eastern slope of the Sierra Nevada Mountains, appears to be one of the outstanding natural generators of waves in this country. Harland C. Ross recently reported his observations of these phenomena.

Robert Symons, his associate, reported vertical velocities of around 30 meters per second at 10,000 meters above sea level. While such energy sources are interesting to sailplanists, their effects on passenger aircraft must not be underestimated. Such a vertical blast could easily demolish a high speed airplane. The contribution which soaring science can make to commercial aviation is evident in this instance. The altitude possibilties of this region are being investigated by Ross, Symons, Paul MacCready, Jr., and John Robinson.

Some purely scientific work on the behavior of potential temperature in regions of vertical flow has been done by the Aerophysics Institute. The author has also made some flights on the sea breeze on Long Island experiencing lifts of 2m/s to a height of 2000 meters. The report on these flights is in process of publication.

Also of note are the observations reported by William Briegleb on the inflow into a convective column near the ground. He emphasizes the hazards to student pilots of stalling while passing through the flow near the ground.

In studying the properties of sailplanes, the Soaring Society's Technical Committee has been carrying on a general program of cataloging many sailplanes by means of full scale flight tests. The following sailplanes have been performance tested: Laister-Kauffmann TG-4A in three configurations, standard, molded canopy and a near highwing version; Kirby Kite; Screamin' Wiener; Prue 160; Pratt-Read TG-32; Ross Ranger II; and Orlik.

Extremely high accuracy cannot be claimed for the simple methods used in these tests but gradually the accuracy is being improved. A small static bomb suitable for single place sailplanes has been developed and has been calibrated at the Brooklyn Polytechnic Institute. Experiments on using glide angle probes are to be conducted shortly. Such a probe will be immune of the effects of turbulence on the flight measurements.