



A SURVEY OF ALASKAN

By Serge A. Korff

EVER SINCE THE COSMIC-RAY EXPEDITION of A. H. Compton's group in the early 1930's to Mt. McKinley, there has been a good deal of interest in the possibility of doing cosmic-ray work on Alaskan peaks. These mountains represent about the only means of obtaining observations over any protracted period at high altitudes and at far northern latitudes. Further stimulated by our own desire to obtain neutron measurements at such elevations and latitudes, it seemed worth while to make a comprehensive examination of the present situation with a view to finding out what peaks could be occupied as research stations, and what difficulties each peak presents. In the survey which is reported herein, the key feature making the entire operation possible was the Piper Super-Cub expertly piloted by Terris Moore, the energetic president of the University of Alaska.

In this ship we made landings on glaciers and small frozen lakes, and Dr. Moore has conclusively demonstrated that it is possible to meet the logistic needs of a scientific expedition in a manner hitherto not dreamed possible.

The high peaks in Alaska are quite few in number. The Brooks Range in the northern part of the territory has no peaks over 10,000 feet and so need not be considered. Similarly, the Coast Range in the main body of Alaska is not high enough, and if one goes south along the coast to where the giant peaks, Mt. Logan (19,850 feet) and Mt. St. Elias (18,008 feet), are located, one is then already between three and four degrees geomagnetic latitude south of Fairbanks. This leaves the Alaska Range and the Wrangell Range. In the Alaska Range are located Mt. McKinley (20,269 feet, the highest peak on the North American continent) and the group slightly to the east including Mt. Hayes (13,740 feet) and Mt. Deborah (12,540 feet). All altitudes and the airline distances quoted here are taken from the latest Air Force map; surveys of McKinley differ by about 30 feet among each other. The northwestern anchor of the Wrangell Range is the 16,208 foot Mt. Sanford, and the flat-topped Mt. Wrangell (14,005 feet). Mt. Drum at 12,002 feet is

the only other high mountain and this was ruled out at once since it is a sharp-pointed peak offering no good flat areas for these operations. We shall therefore consider the merits and difficulties presented first by McKinley, second by the Hayes group, and third by the Wrangell-Sanford complex.

The problems posed by Mt. McKinley are by now well known. This peak, climbed for the first time by Belmor Brown and Archdeacon Stuck in 1912-13, has been ascended several times. It was the scene of the cosmic-ray expedition in 1932 in which Carpe and Coven fell into a crevasse. Bradford Washburn, Director of the Boston Museum of Science, has climbed the peak several times and gave logistic support to Schein's group operating at 19,000 feet at Denali Pass in 1947. In this case, air drops were used, and much of the heavy equipment was dropped successfully from transport planes. Both parachute and free-fall drops were tried. During the summer of 1951, Dr. Moore landed his plane on the Kahiltna glacier at 10,000 feet and brought supplies, equipment, and personnel to the expedition of the Boston Museum of Science and Denver University which was then on the mountain. At the conclusion of the latter expedition, all eight members of the party were removed by the plane from the 10,000 foot level.

The peak lies about 160 miles from Fairbanks, and while part of the mountain can be seen on good days, line-of-sight communications with the University from the usual camps appear to be impractical. Radio contacts are made at lower frequencies using ionospheric propagation techniques. Because of the great height of the mountain and its relatively isolated location, considerable atmospheric turbulence is often present, and present estimates seem to indicate that on the average one day per week of good flying weather may be expected. While it is undeniable that the maximum altitude is available on this peak, it is secured at the expense of poorer weather and, on the average, the most adverse flying conditions of any region that we considered. During my stay in Alaska, the summit was visible only for a few hours one day.

PEAKS

Last April the author with Terris Moore, president of the University of Alaska, conducted a survey of various mountain peaks in the territory of Alaska in an effort to determine the feasibility of establishing high altitude cosmic-ray stations in the far north.

We next turned our attention to the Hayes group. These peaks lie about 90 miles in an air-line across the great Central Valley from Fairbanks so that one can see the weather conditions there from many of the windows of the University buildings which face south. Moreover, since the areas suitable for landing and establishing cosmic-ray observing stations are on the north side of the mountains, line-of-sight communication at high frequencies (for example, modified walkie-talkies) is possible. We spent some time flying among the peaks and spotted several possible landing places at altitudes between 9000 and 12,000 feet.

A ground party approaching this group would go along the Alaskan Highway, turn south on the Richardson Highway, and base at the lodge at the foot of the Black Rapids glacier. From here the high camps are reached after about twenty miles of uphill walking along the glacier. During the season of our flights along this glacier, it did not appear to be particularly heavily crevassed. Landing a small ship at the foot of the glacier and at various points along it is entirely feasible, and thus the main supplies of the party need not be carried by porters. Estimates of weather indicate around two and one-half days of good flying weather per week on the average. It appears entirely feasible to install and support bases on this group of peaks at altitudes between 10,000 feet and the 13,700 foot summit. The operation appears to be much easier than the corresponding task on McKinley.

Ground access to McKinley is via the Alaskan Railroad to the Park headquarters, then by auto to a point about twenty miles from the base of the mountain after which one must walk the rest of the way across rugged terrain before the ascent starts.

It thus takes several days longer to get overland from Fairbanks to a 10,000 foot level on McKinley than it does on Hayes. The air flight is also twice as long, and since more gasoline must be carried, cost is increased and the payload in instruments or personnel is decreased. If extreme altitudes are not required, Hayes is a much easier operation than McKinley.

We next investigated the Wrangell Range peaks.

Here Mt. Sanford has a broad flat top, and Mt. Wrangell has an even bigger, broader, and flatter top. The summit of Mt. Wrangell is, incidentally, within about a hundred feet of being at the same altitude as the summit laboratory at Mt. Evans, Colorado. From the performance of the ship, we estimated that we could probably not land on the summit of Sanford and expect to take off successfully, but a landing on the broad flat top of Wrangell seemed feasible. Indeed Wrangell presented a plethora of good landing places above 9000 feet. Rock outcrops exist at several altitudes on Mts. Wrangell, McKinley, Hayes, and Deborah, should they be required for anchoring structures or equipment; but the summit of Sanford is ice, probably 150 feet thick. Moreover, since Wrangell has a number of active steam caves near its summit, it seems quite possible that heat and perhaps even power can be obtained for a station.

In order to test the possibilities of logistically maintaining a station here, we landed on a small frozen lake on the slopes of Sanford. There was about a thirty-mile wind blowing, and we came in with almost zero ground speed. We disembarked and took the photograph shown on the cover. It was quite evident that the problems of installing and maintaining a station here could readily be solved with air support. We turned the plane around on the ice by hand and took off with a very short run, less than one fourth of the lake surface bearing out ski-prints when the operation was completed.

With a full load and zero wind, we estimated that we would still not require the full extent of the lake. We spotted several other lakes at various altitudes, all of which would have been equally suitable. An operation in the Wrangells would base at Gulkana. Here the CAA radio maintains a twenty-four-hour patrol on aircraft frequencies, the summit is attainable in half an hour's flying time, line-of-sight communication is again possible, and weather can be judged by looking out of one's window at the peaks. Wrangell appears to be an easier operation than Sanford if the extra 2000 feet of

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altitude is not of vital concern. Good flying weather is estimated to average two days a week. While a ground party from Gulkana would require a hiking time of about a week to reach the summit, it could be flown three-quarters of the distance in a day's operation, one man at a time, plus supplies, even on a day when the upper parts of the mountain were covered with clouds. Gulkana is on the highway connecting Fairbanks with Anchorage, and is about 220 and 170 road miles respectively from these cities.

Some factors are common to all the Alaskan peaks. The geomagnetic latitude lines curve in such a way that all peaks considered here are within half a degree of each other. Also, because the air column above the peaks is on the average colder than in the U.S., the pressure at 14,200 feet (Mt. Evans) in Colorado corresponds to that at about 13,400 feet in Alaska; 10,800 feet (Echo Lake) in Colorado correspond to about 10,300 feet in Alaska.

From these studies we conclude that the Wrangell group is the easiest on which to install and maintain an observing party or high altitude station; Hayes is next and McKinley is the most difficult and expensive. An expedition to the latter would appear to be justified only if the last few thousand feet of ultimately attainable altitude was essential. Moreover, it seems to the author that Dr. Moore has conclusively demonstrated that a party can be brought in, supplied and maintained by air, and that air operations can be successfully carried out at altitudes not hitherto considered possible. Numerous Alaskan "bush-pilots" are available on charter basis to support such an operation.

The significance of this exploratory work is that it demonstrates that a party can be landed on a peak, at or close to the station which they will occupy, by air. It can also be supplied by air, and five trips, requiring less than a full day, will enable a ton of equipment and supplies to be delivered. Once or twice a week the party can be visited, additional supplies delivered, and personnel rotated and evacuated when the research is complete. In a day's flying time, it is possible to place on the mountain a party, fully supplied, instead of having to depend on weeks of overland lugging by porters. As compared to the salary budget of such personnel, the cost of air support is modest indeed. This kind of air support saves weeks of labor and much expense.

Previous experiments in air support involved large transport planes of the Air Force making drops. Personnel cannot ordinarily be landed this way; and indeed only occasionally can such an operation be arranged at all. It is also true that large Air Force transports, assisted by JATO, have landed on the ice in connection with the Juneau Ice Field Research Project, but the cost of such an operation is probably two orders of magnitude greater than ours. The mechanical features making our work possible were (a) an engine more powerful (125 hp) than the usual engine (75 hp) of a Piper Cub, and (b) a ski-wheel combination landing gear which enabled us to land at will on ice or on hard ground.

News and views

Two New Computers

At Princeton and Los Alamos

Descriptions of two closely related electronic digital computers, one at the Institute for Advanced Study at Princeton, New Jersey, the other at the Los Alamos Scientific Laboratory in New Mexico, were made public for the first time in June. Both are designed to perform very high speed calculations in pure and applied mathematics and in mathematical physics.

The Institute's machine, which has been a work in progress for the past six years, is actually the prototype for the Los Alamos computer and for various other machine developments, including two more for the AEC and one which was recently completed by the University of Illinois for the U. S. Army Ordnance Corps Ballistic Research Laboratories at the Aberdeen Proving Ground. Prior to the Institute's public announcement the Princeton machine had successfully completed a number of quite extensive problems. One of these was a large calculation of about twenty million multiplications to test a conjecture of the famous 19th century mathematician, E. E. Kummer, which had never been established. The machine did this work in six hours. Two considerably shorter astrophysical problems (each requiring the solution of three simultaneous differential equations) and a number of cubic diophantine equations were calculated. In addition, work was done on several twelve-hour meteorological predictions covering the continental United States, each amounting to about 800,000 multiplications and requiring about one hour of continuous computing time.

Data can be fed into each machine in either decimal or binary form, but the instrument proper carries out the calculation in the binary number system since it is more convenient electronically. Each number handled by the machine consists of a sign and 39 binary digits which are equivalent to a decimal number with a sign and approximately 12 decimal places. It produces 2000 multiplications, 1200 divisions, or 100,000 additions per second. Each machine consists of an arithmetic system which carries out these processes, a control system which executes the instructions given the machine, a memory system in which both the numerical data of the problem and the instructions which characterize the problem are stored, and an input-output system which intervenes between the human operator and the machine. The memory, which is capable of storing 1024 numbers of forty binary digits, is a system of