THE careers of many business men have been completely changed by circumstances. Similarly the Aero Service Corporation (started in June, 1919, as the Pennsylvania Aero Service Corporation but changed in 1920 in order to avoid confusion with another company known as the Philadelphia Aero Service) had as its primary business interest that of promoting air transportation.

In an old scrap book, filled with clippings relating to the trials and tribulations of the earlier days of the company, are found many accounts that are most interesting. One account tells of an exhibition race between a Chevrolet automobile and a Curtiss JN 4 Airplane. This race, which attracted thousands of people, was held on October 23, 1919, at the Belmont Race Track. The articles go on to relate at length how the airplane barely managed to beat the automobile in 5 laps around the one mile track, making the astonishing time of 5 minutes and 3 seconds for the total distance. It is interesting to read that the automobile was only a short way behind at the finish of the race and that the pilot, Neil S. Johnston, had to show great ingenuity and skill in order to come in as a winner.

A lawsuit brought against the company for carrying passengers on Sunday is another interesting side light on the problems of twenty years ago. According to the blue laws if flying in an airplane could be classified as a sport then such activity would be prohibited. If it were classified as a means of transportation then this would be permissible on the Sabbath. The Company finally managed to convince a judge that an airplane could be classified correctly as a means of transportation and cited the fact that they had flown passengers from Philadelphia to Wilmington, Delaware, on matters of life and death as a means of saving valuable time. A regular airline was proposed to carry passengers from Philadelphia to Atlantic City and New York, this being considered quite an extensive circuit to be covered.

As time passed the company's interests became more diversified. An advertisement in a newspaper, dated May, 1920, showed that the company was interested in giving flying instructions and doing aerial photography in addition to air transportation. Most of the aerial photography which was undertaken at first was in the nature of obliques. Views were made at an angle by pointing the camera over the side of the airplane. Attempts were made to sell such views by advertising.

Mr. Virgil Kauffman joined the organization in 1924 because of his experience in photography and in aviation. Due to his foresight and confidence in the future of aerial photography all activities not related to aerial photography were discontinued at this same time. His sales efforts and ingenuity soon increased the oblique business. In addition he flew the airplane on the majority of the photographic undertakings and soon found it unnecessary to have a photographer along. With a specially mounted camera, and a means of tripping the shutter by remote control, he was able to secure satisfactory oblique photographs doing the entire operation alone.

In 1927 Mr. Kauffman became President of the Corporation and about this time the engineering uses of vertical aerial photographs became more widespread. The Corporation devoted more and more of its efforts to the making of
such vertical photographs and mosaic maps. The mosaic made for the Philadelphia Regional Plan, covering approximately 4000 square miles of area, was perhaps one of the largest mosaic undertakings to have been completed in 1928. It was successfully used in the extensive plan prepared by the commission. Many other projects were completed such as transmission lines, city areas, and water front surveys.

In 1932 when all of the State of New Jersey was photographed as a single project it marked another turning point in the history of aerial photography as it was the first complete State to be mapped by this means. The work was undertaken without a specific contract, making the negatives corporation property and free from restrictions. Later mosaics were made of the entire state, copies of which were nominally priced, and made available to the public.

In 1934, when the Tennessee Valley Authority was organized and the problem of mapping the large area rapidly was taxing the ingenuity of various mapping organizations, it was our privilege to cooperate with the Authority in securing 5 lens aerial photographs of the entire area. At a later date we again accomplished something new by assembling these 5 lens pictures into a reconnaissance type of mosaic map which gave the T. V. A. an opportunity to determine, in a general way, the nature of the terrain and the location of various natural and man-made developments.

Aero Service Corporation pioneered many of the improvements in aerial photographic equipment and operations largely due to Mr. Kauffman's interest in field operations. The first aerial cameras to expose a \(9 \times 9\) film were made and developed in our own shop. This size negative, because of its advantages for greater coverage and better radial line figures, was adopted by many others. Later in 1938, in cooperation with Bausch and Lomb Optical Company, a \(5.2\) focal length lens covering a \(9 \times 9\) negative was perfected. When, in 1939, Dr. Lovelace was perfecting his oxygen mask and control equipment for use by pilots, we were privileged to cooperate on the early experiments. We were the first to adopt the equipment for use for our photographic crews. Since that time it has been adopted by many organizations and military fields of aviation.

During the development of the Aero Service Corporation another mapping Company was developing, in Philadelphia, under the guidance of Mr. Arthur Brock and associates. They accomplished, well in advance of all others, research and experimentation in the preparation of topographic maps from aerial photographs. As early as 1914 aerial photographs were taken of Fort Sill, Oklahoma. It is interesting to note that during the First World War most of the aerial cameras made for use by our forces in 1917 and 1918 were Brock aerial cameras. Thereafter an engineering firm, Brock and Weymouth, was formed to specialize in problems of hydraulics. As a means of preparing accurate maps, needed for planning reservoirs and hydro electric projects, the topographic mapping from aerial photographs was very completely studied. This resulted in the first topographical map made by this method—the Media Triangle completed in 1922. Later on this same organization completed topographic mapping in France, Italy, and Canada. In this country such important projects as the Boulder Dam site, Saluda River Hydraulic Project area, Conowingo Dam and Reservoir area were completed to a high degree of accuracy and precision. A small project showing one foot contours was made of an estate as a means of conclusively proving that such a small contour interval map could be made with the aid of aerial photographs. All of the assets, patents, drawings and equipment of the Brock and Weymouth Company were acquired by us in 1938. It is still the only completely American method for the making of accurate topographic maps from aerial photographs.
Up to this time the laboratory and office had been located at 1612 Chancellor Street in Philadelphia. These quarters were ample at first but in later years even the use of an adjacent building was very inadequate for the amount of production going through the laboratory. When we moved to our present location in 1939, increasing our floor space to 25,000 square feet separated on three floors, all the Brock Equipment was permanently installed. Some changes in the nature of refinements were made and, in the course of operating the equipment, methods and procedures were revised in accordance with improvements in technique and equipment that had taken place since the Brock equipment was previously used. Now large munition area contracts have been completed showing 2 foot contours in some instances, 5 foot contours in others and at scales ranging from 1 inch equals 40 feet to 1 inch equals 100 feet. These projects were completed in a short space of time as this was essential because of the urgent need of the maps for construction purposes. All of the work was guaranteed that 90% of checked points would not exceed one contour interval in error. In the course of this work methods of training inexperienced personnel were developed so that now it is possible to do this type of work on a production line basis for the first time. In other words, various people are trained to do but a small integral part of the entire procedure and by confining their efforts to such a segment of the total work, the training period is greatly reduced and the efficiency of operations are rapidly developed.

The early development of a precision aerial camera was undertaken and
accomplished in our laboratory. This American built camera makes it possible for us to secure aerial negatives which are suitable for use with the multiplex mapping equipment. The Geological Survey, in their Chattanooga office, prepare contour maps with this equipment. Fortunately, this development of a satisfactory camera, prior to the present war, has prevented any interruption of a mapping program important in our defense program.

Our work in perfecting the use of the short focal length lens which covers a $9\times9$ negative has made it possible to economically photograph large areas in this country, as well as foreign countries, especially where weather conditions are unfavorable. The wide angle of the lens permits wide separation between flight line thus decreasing the amount of flying necessary to cover an area.

Research at present is concentrated to further the mapping projects which are part of the National Defense Program. The methods and experience gained in the preparation of precise mosaic work covering 11,000 square miles in Utah are now being used on an Army project. We are at present making a precise mosaic for the U. S. Army, specifications of which call for such a high degree of accuracy that no points selected shall be at variance from their true position on the mosaic by more than one fortieth of an inch.

In the preparation of a new type of reconnaissance map a further development has been made possible by the use of an ultra short focal length lens installed in one of our precision cameras. It enables us to secure approximately 60 square miles of territory at a scale of 1 to 72,000 in an 8" circular picture. Final reconnaissance maps can be made by enlarging a section of the center of this negative to a scale of 1 to 20,000 corresponding to a 5 minute quadrangle. This method was recently employed as a means of preparing most rapidly a reconnaissance aerial photographic map of a large section of territory of which 5 minute quadrangle maps were reproduced.

At the present time our organization operates 15 specially equipped airplanes for aerial photography and has approximately 90 employees. New problems, new methods, and developments are proceeding more rapidly as time goes on. Many of these are of material aid in furthering the present defense program.