Survey of air-age education in grades seven, eight, and nine in twenty-six Montana schools

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A SURVEY OF AIR-AGE EDUCATION IN GRADES
SEVEN, EIGHT, AND NINE IN TWENTY-SIX
MONTANA SCHOOLS, 1950-1951

by

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B. S. Eastern Montana College of Education, 1947

Presented in partial fulfillment of the
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CHAPTER I

OBJECTIVES OF THIS STUDY

Every invention beginning with the discovery of the wheel has brought about many changes in the social and political arrangements of the world. In this rapidly changing world in which air transportation plays such an important part, there is a definite need for air education in our schools. Education must start now to try to capture at least the major outlines of aviation's influence in our present day world and the world of the future. The changes to come may be more significant than we can imagine at the present time. Our own generation must be brought to a realization of these changes.

Children of junior-high school age begin to develop an interest in the changes which are taking place in the world outside of their immediate environment. At this age they become aware of the fact that they must accept certain responsibilities as a citizen.

We will probably find it quite easy to get a group of youngsters, at this very impressionable age, interested in airplanes and the various phases of aviation. The word "aviation" in itself seems to have an appeal to their keen imaginations.

A teacher in an air-minded world must keep several definite objectives in mind when he plans a program in air education.

The following objectives are quite brief but they do indicate in a general way what may be a starting point.

(1.) To develop an awareness of the types of planes and
the peace-time services that can be rendered by aircraft.

(2.) To develop an appreciation of how aviation effects our methods of living and thinking.

(3.) To develop an understanding of global relationships and inter-relatedness of communities.

(4.) To understand the effect of air transportation on the development of backward peoples of the world.

(5.) To understand how the airplane has made it possible to extend colonization into new areas.

(6.) To understand the influence air transportation will have on future world security.

(7.) To develop a new concept of global geography.

(8.) To understand the changes the airplane has made in time and space relationship.

Young people, generally, fail to see the social significance of the airplane. They do, however, respond more quickly and more favorably to the scientific aspects of aviation. They build model airplanes. They learn to identify various types of aircraft. They know that mountains and oceans, deserts and swamps are no longer barriers to those who wish to transport goods. They see that the airplane is reducing distances.

The role of science in the air age needs no overplaying. Indeed, it is well to keep in mind that it is just one of the many aspects of the age which needs amplification and clarifi-
cation. Although there is little doubt that science is responsible for much of the development in the air age, care should be taken that it is placed in its proper light with respect to the over-all picture.¹

The questions arise: Do junior high school students know what all this means socially? Have they an understanding of the new problems that are created by the invention of new methods of transportation and communication? What are the consequences of holding, in an air age, values that were held in a more primitive age? The airplane can carry people to any spot on the earth. The people in the airplane may deliver atomic bombs or they may deliver food and medicine. The destination and the cargo of an airplane depend entirely on what country controls it and what its philosophy is. The airplane is a product of the scientific method, and may be used for good or evil purposes. Purposes are good or evil only in terms of a philosophy. The airplane, by reducing the physical distances between people with different philosophies, has increased the need to develop within the world common understandings based upon mutual interests.²

Shall we let the airplane cause social complications, or shall we by exercising foresight adjust ourselves to the air age?

² Ibid., p. 122.
It is impossible to know what the possible effects of the air age are upon society. That they are many and complex is apparent. To say the least, the impact of the airplane differs in degree from the effects of the railroad and the automobile.³

Aviation must be considered in its relation to all other aspects of our social order. Aviation is part of a great jigsaw puzzle. The trend of the immediate future is to piece this puzzle together into a complete picture. This requires what may be called "social engineering." Unhappily our social science has tended to lag behind our technological development. America and the rest of the world must, by thoughtful and careful planning, catch up with technology. The airplane will not wait. In short, we must plan for the profound changes aviation is bringing about. The airplane provides a new mode of transportation, the like of which the world has never seen.⁴

A considerable amount of literature has been published in the last few years pointing out the need of subject matter in school programs pertinent to the multiple phases of aviation. Attempts have also been made to furnish schools with materials along these lines. Most of the material emphasizes the importance of aviation in the future, its effects upon our society, and the need of understanding how society will be changed be-

⁴ Ibid., p. 300.
cause of the wide-spread use of aviation. Educators have developed both immediate and future programs for acquainting children with the new invention and stimulating their interest in its many mechanical, as well as social, aspects.

Essentially, it is an attempt to inculcate air-mindedness in American youth.

The need for fostering "air-mindedness" was recognized by Robert Hinckley, assistant Secretary of Commerce for Air, when he described the educational problem in this manner.

The main handicap to mass flying, all along, has been that travel in three dimensions is an awesome thing to two dimensional people. I can remember that solid geometry seemed much more difficult than plane geometry. The air is a strange new element to man, and it will be taken in stride, as a matter of course, only by people who have learned the principles of flying in their youth and who have applied those principles in actual practice. After that the fearful mystery is gone. Flight is then a matter of some principles in physics, like a change in temperature.

I call this process the "air conditioning" of people. We must have a whole generation of people who are air conditioned.\(^5\)

As to the effect of aviation on the organized education of the schools, the most important changes will be those in curricula, with scarcely a subject being untouched in some way. The process of air age education, then, is to integrate aviation subject matter with courses already established as part of the curriculum in any school.

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Pearl Wanamaker, Superintendent of Public Instruction of the State of Washington stated:

One thing we must all keep in mind is that, whether we like it or not, we are perhaps the last earthbound generation. The oncoming generations will take to the air as we took to the automobile. We should also remember that the present group of youngsters are being taught by an earthbound generation of teachers. Most of our teachers have not had an opportunity to learn about the air. We must equip them for this responsibility.

We should all recognize that air-age education must be an integrated program until specialization takes place later in the secondary and technical schools. The purpose should be a program of implementation, integration, enrichment, and orientation. An understanding should be developed of the influence of aviation upon the individual and upon community life and its activity. 

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CHAPTER II
HISTORY AND DEVELOPMENT

If a child in school was asked to tell the story of the airplane he would very likely begin with the Wright Brothers. It is commonly believed by many people that aviation did get its start at that memorable event in 1903 when two bicycle mechanics made the first successful flight.

One might reasonably raise the question: When did the air-age begin? Certainly the roots of the air-age go back to the mythology of the ancient Greeks or are found in the writings of the Bible which indicate that man has been "air-minded", at least in his thinking, since the beginning of recorded history. The study of birds and the resulting attempts to imitate them have been a stimulus to scientific men. Like many other discoveries, the airplane is an evolvement from the work of many men, rather than the invention of one.¹ The airplane has also had profound effects on transportation and communication.

In order to evaluate the possible effects of air transportation on communities and trading areas, glance back into history and consider the evolution of business patterns as they are known today.

¹ Alberty, Op. Cit., p. 302
With the early pioneers, each family by force of necessity was more or less self-sustained. Soon, however, individuals with skills in blacksmithing, milling, weaving, and other crafts appeared, selling their services and products. As more settlers arrived, communities and towns developed, evolving from these single business activities. The influence of these early pioneers spread to the extent that transportation facilities of the day made these towns accessible. Proximity to competing towns determined marketing and distribution, and controlled quality of goods.

A new form of transportation with an almost incalculable influence on our economy began in the 1830's with the construction of railroads. They sped the development of the West and directed the flow of settlement. Among the many economic effects exerted by the railroads was the greatly increased influence of the larger trading centers. Instead of many small areas, we had larger regions with better central facilities.

Then came the automobile, another new form of transportation which modified our marketing factors just as effectively as the railroad had in the decades before, increasing the size of the larger trading areas and absorbing the influence of the lesser markets.

Now comes a new transportation system, aviation. The factors that inaugurated this new system of transportation
are technology, business, and government. These factors are closely interwoven in the early history of aviation.

Man has always marveled at the ability of the bird to fly. After men have marveled at a phenomenon for a few centuries some philosopher is certain to study, to conclude, and to write upon the strange subject.

Da Vinci, in his "Treatise on the bird" expressed the same ideas upon which the modern glider has been built and flown. Borelli explained the theory of flight as a series of leaps through the air. A bird in flight does exactly that; leaps, by a movement of the wings, successively through the air. These pioneers in the aerodynamic thought figured upon some kind of arrangement in which man could simulate the action of the bird. Their supposition was that wings might be attached to the arms and be oscillated by them. However, their computations convinced them that no such scheme could ever work because they found out that the pectoral muscles of a bird commanded over two-thirds of the bird's entire muscular strength. In man's arms were to be found only one-fifth the strength of his body.2

Scientists of the early Middle Ages were pure theorists and made no attempt whatever to test any possibilities by models.

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or real gliders. The venturesome must have believed the conclusions of da Vinci and Borelli to be gospel because 1675 arrived before any record can be found of even an attempt being made by man to fly. In that year Besnier constructed a flying apparatus which he claimed to have flown as a glider. Some doubt is manifest in the records as to what really was accomplished with the machine.

By the beginning of the nineteenth century model gliders had been made to fly, and men had flown short distances on gliders. Most of these hops had been down hillsides and the altitude attained had never been fifty feet. Cayley, often referred to as the father of English aviation, concluded, by 1810, that there must be some mechanical power, some engine, in the machine to make aviation a success. He, at the same time, proposed that the steam engine was too heavy. The construction of the plane had been a very simple matter. The building of a light, fast motor was to take almost another century.  

In 1849 an Englishman, named Stringfellow, constructed and flew a model airplane under its own power. The machine, with two propellers, longitudinal and vertical controls, that is a rudder and an elevator for steering, was driven by a small steam engine. This was the first self-propelled airplane.

3 Ibid., p. 8.
Stringfellow, hampered by his age and lack of funds, died with his work unrecognized.

Lilienthal, a German scientist, took up the development of the glider. The proportionate size of the wings and body of the gliders that he built were planned with reference to the buzzard, the most perfect glider. Wings built of wood or bamboo were braced and covered with linen or silk. The shape of a bird's wings was followed to minute detail. The man flying the glider controlled the angle of the wings with the line of flight by his arms. Lilienthal made over 2000 glides near Berlin before 1891 when he met his death. He contributed to the science of aviation information regarding air currents which has permitted the construction of successful air craft today. One of his contemporaries, Pilcher, an Englishman, deserves study for the size of the glider that he produced and flew. The "Gull" had a wing area of 300 square feet and weighed 55 pounds.4

In 1891 Lilienthal built his first glider. After five years practice with gliders, he decided to attempt a flight using compressed carbon dioxide to make his wing tips flap. Unhappily, when about fifty feet in the air he mishandled the new rudder control and crashed to earth. His back was broken and he died the next day.

4 Ibid., p. 9.
Among others who experimented with gliders about this time was Octave Chanute, the American father of gliding flight. He built and flew several full-sized gliders in 1896-97. Instead of placing the pilot in a prone position and depending upon him for the stability of the craft, Chanute introduced the idea of inherent stability. That is the pilot maneuvered the glider to the right or left, up or down, from a sitting position, by means of levers and a tail, with elevator and rudder. He assumed this position instead of lying face down, arms outstretched and canting his body in order to make turns, ascents or landings.\(^5\)

S. P. Langley began work in the year 1891 on what he called his "airdromes". Year after year he tried and failed to make a plane that would support a man and would be propelled by a steam motor.\(^6\) His first truly successful model was flown in 1896. Congress, impressed with Langley's experiments, gave him $50,000 to build an actual power-driven airplane. Langley's co-worker and pilot-to-be, Manly, built a five-cylinder "naptha" motor, a marvel of lightness for those days, since it weighed just a shade more than two pounds per horsepower. Meanwhile, Langley worked on the airplane.

In October, 1903, the plane was launched from a catapult on a barge in the Potomac and slid with a splash into the water.

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Two months later they were ready to try again, but this time something went wrong with the catapulting apparatus, which damaged the rear wing. Again the airplane (aerodrome) sank beneath the waters of the Potomac. Langley stopped his work.\textsuperscript{7}

Wilbur and Orville Wright were engaged in the manufacture of bicycles at Dayton, Ohio, when in 1896 they became interested in the study of aeronautics. They proceeded with their research in a careful and scientific manner. They reached conclusions as to the structure of wings, motive power, balancing and steering before they made any attempts at construction. Then in 1900 at Kill Devil Hill in North Carolina the brothers made their first flights in gliders. These original flying machines were much the same in type as those of Lilienthal and Chanute. From their tests the Wrights determined that soaring flight could be accomplished because of the air currents ascending up the side of a hill. This was the first satisfactory explanation of the theory of gliding flight. For the next few years the brothers built glider after glider, each one an advance over its fore-runners, and by 1902 they had made 1000 glides and had attained 600 feet as a minimum altitude. All of their experiments were made with biplanes. Their gliders were thought to be stable enough by 1903 to open consideration of mechanical motive power.\textsuperscript{8}

\textsuperscript{7} Bartlett, \textit{Op cit.}, p. 20.

On December 17, 1903, came a truly great moment in the long history of flight. On that day in Kitty Hawk, North Carolina, Orville and Wilbur Wright made four successful flights. All flights were made against a twenty-one mile wind, starting from level, with engine power alone. The average speed through the air was thirty-one miles per hour and the longest time in the air was fifty-seven seconds.

They spent the winter of 1903-1904 making a more powerful engine and built a stronger, larger airplane. By September, 1904, they had learned how to make simple turns and circles. Early in October they made flights of more than twenty miles.

In September, 1908, the United States Army bought from the Wrights a plane that surpassed the specifications the Army had laid down. Late in 1908 Wilbur Wright astonished Europe by a sustained flight over France for more than two hours.

The story of the airplane from early days of the Wrights is, in a sense, a catalog of aviation meets, races for cash prizes and like events.9

The work of the Wrights was being paralleled in Europe by Louis Bleriot. Bleriot's contribution introduced a flapping wing model airplane in 1900, but failed for want of a proper engine. In 1909 he introduced the "joy stick", which maneuvers the controlling surfaces, making it possible to steer the plane to the right or left and up or down with the same lever. On July 25,
1909, this man gained for himself fame in the history of air by making the first successful crossing of the English Channel. The twenty miles were covered in thirty-seven minutes.\textsuperscript{10}

Before 1926, civil aviation was disreputable and dangerous. There were no regulations, and anyone who could buy a plane could fly it. Those who did own airplanes were generally in show business, and the airplane was regarded as a risky toy, not as a transportation medium.

Then the Air Commerce Act was passed, charging the commerce department with the responsibility of developing safeguards, establishing airways and fostering air trade.

Two very important steps had been taken. The national scope of air commerce had been recognized and the United States assumed sovereignty in the air and prevented the growth of conflicting air codes. The federal government had adopted another industry. Henceforth, airlines would be subsidized as railroads and highways had been. In effect, the American people had bought stock in air transportation.

The Civil Aeronautics Act of 1938, amended in 1940, unified federal control in the civil aeronautics administration and the Civil Aeronautics Board. The board is concerned with economic regulation, issuing certificates of public necessity, fixing air mail and passenger rates and passing on air line mergers. The board also formulates safety regulations and

investigates accidents. The board is an independent body, while the administration is an agency of the commerce department.

The civil Aeronautics administration establishes, maintains and operates the federal airways system, promotes aviation safety, assists in airport construction, and has a number of other functions aimed at expanding and improving civil aviation.

The United States has 57,000 miles of civil airways, as compared to 8,252 miles in 1926. An airway is 20 miles wide. Air traffic keeps to the right just as automotive traffic does, and in a busy airway planes are separated from each other by 1,000 or more feet of altitude.

Each airway is marked and lighted for visual navigation, and provided with radio communications stations for contact with aircraft, radio-range beacons for directional guidance, and radio marker stations and airport landing aids. The network of airways is served by teletype circuits which carry weather and traffic information.

The aviation safety office of the C. A. A. enforces air safety regulations and promotes safety through educational guidance. It examines and certifies pilots, mechanics and dispatchers, flying schools, aircraft and air navigation facilities. No one can fly without a C. A. A. license, and no airplane may be flown without an air-worthiness certificate.

The 1926 act prohibited federal aid to airports but the restriction was lifted by the act of 1938, after much airport
work had already been done by federal relief agencies during the depression.

In 1940 Congress gave the Civil Aeronautics Administration $40,000,000 for airports.\textsuperscript{11}

The Federal Airport Act of 1946 authorized $500,000,000 more to be matched by equal sums from local sponsors.

The law states:\textsuperscript{12}

For the purposes of carrying out this act with respect to projects in the several states, annual appropriations amounting in the aggregate to $500,000,000 are hereby authorized to be made to the administrator over a period of seven fiscal years, beginning with the fiscal year beginning June 30, 1947. The appropriations for any such fiscal year shall not exceed $100,000,000 and shall remain available until June 30, 1953, unless sooner expended.

The volume of civil flying exclusive of scheduled commercial operations increased greatly during World War II. Under the impetus of the civilian pilot training program, civil flying increased again in 1946. The year 1946 was the first full peacetime year of business since 1942. During this year the aviation industry made great strides. Certified air carriers, free once more to acquire new and additional flight equipment, expanded their domestic air-craft fleet from a total of 378 in October, 1945, to approximately 700 in October, 1946.\textsuperscript{13}


The biggest peacetime boom in civil aviation is agricultural flying. At the annual crop dusting and spraying school conducted by Montana State College at Bozeman in February, 1950, H. B. Mitchell of the C. A. A.'s Washington office observed: 14

Little did I or anyone else think in 1928, when I first started flying dusting airplanes, that aerial dusting and spraying would some day be the fastest growing part of civil aviation. No one would have believed that in 1950 there would be over 1,500 operators and 5,000 civil aircraft engaged in dusting, spraying, seeding and fertilizing, but today we have that many.

14 Editorial in Billings Gazette, November 12, 1950
CHAPTER III

REVIEW OF LITERATURE

During the past several years, especially since World War II, much has been written and said about air age education in our schools. Educators, in recent years, have seen a definite need for this type of program.

In November, 1944, the representatives of fifty-two nations met in Chicago to establish an international organization insuring that wartime flying progress would be carried over into civil aviation and that air transport would not become a source of friction among countries. The conference led to the establishment of the International Civil Aviation Organization (I. C. A. O.) in April, 1947. Membership has grown to fifty-eight nations.

I. C. A. O. works toward greater uniformity, safety, regularity and cooperation in international air transport. Its program in 1950 included: 1


(1) Development of standards for international flight, including reduction of red tape at national air ports.

(2) International financing of air navigation services used by airlines of several nations.

(3) Technological assistance for economic development.

(4) Solution of regional aviation problems.
(5) Development of international air laws.

(6) Development of multilateral agreement to govern the exchange of commercial air rights.

The world Congress on Air Age Education, composed of appointed representatives of many educational institutions throughout the world, has given due consideration to many of the social, economic, technical, and political problems associated with the rapid advance of aviation and especially of international air transportation. Its conclusions have been set forth in the proceedings of the Congress and, as a result thereof, this Congress presents the following resolutions to be submitted to appropriate agencies throughout the world.

Be it resolved that:

(1) Mass travel by students and teachers within the countries and among the countries of the world shall be encouraged to the fullest extent.

(2) Appropriate agencies shall be encouraged to further technological development in order to provide more efficient and economical air transportation for that specific purpose.

(3) The organizations of education of the countries of the world shall be encouraged to create agencies for air age education.

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(4) This World Congress shall call upon the United Nations Educational Scientific and Cultural Organization for assistance in the development of its program.

(5) The Organization Committee of this Congress, with the addition of other persons including representatives of other peoples of the world, shall be made a continuing agency for the purpose of implementing the proposals of the Congress.

(6) In order to facilitate this work, Air Age Education Research shall be appointed to act temporarily as Secretariat of the Organization Committee and the liaison agency among interested groups throughout the world.

(7) It shall be the duty of this committee to encourage and assist the development of air-age education activities in other countries.

(8) This Committee shall also explore the possibility of the development of a permanent organization of air-age education.

W. H. Taylor, Principal, Classen High School, Oklahoma City stated:

A new era in secondary education began on the morning of May 8, 1946, as sixteen students and the teacher of the distributive-education classes of Classen Senior High School took off from the Oklahoma City airport for Dallas on the first educational air excursion of its kind.3

3 Ibid., p. 50.
F. C. Bishop, H. M. Staff Inspector of Geography, Ministry of Education, England, said:

Classroom lessons must not be based on an obsolete conception of the world, but on the world as it is today. In the elementary school there will be no need to make air-mindedness a subject of its own, but rather to bring in the air and aviation to provide illustrative material for a variety of subjects and generally to enrich the curriculum with an infusion of air interest. 4

Philip S. Hophins, Vice President, Links Aviation Devices Incorporated cleverly stated:

We all have, in our youth, played that grand old game of hide-and-seek, where the one who is "it" blinds his eyes and counts to 50 while the others hide. At the end of the count, he calls out, "Ready or not, here I come". That is our status with the air age. 5

Gael Sullivan, Second Assistant Postmaster said, "A trip around the world is comparable to a university course in the humanities and hard realities". 6

William T. Piper, president of Piper Aircraft Corporation and maker of the famous "Piper Cub", stated:

Over half a century ago, a Methodist Bishop in a discussion with his ministers heard one of them say, "Well, that's just as impossible as flying". Another young minister answered, "oh, I don't know. I think we'll fly sometime". Redfaced, the old Bishop arose and said, "young man, for that statement your soul will fry in hell, because according to the Good Book it is possible only for the angels and archangels to fly".

Sometime later, it was rather embarrassing for the good Bishop to recall this incident because of the activities of his own two sons. His name was Bishop Wright. 7

5 Ibid., p. 18.
6 Ibid., p. 32.
7 Ibid., p. 22.
The Committee on Elementary Education, of which Leon S. Waskin and Walter A. Andrews were co-chairmen, reported the following:

At the Denver Air Congress, the elementary group pointed out very properly that the school program should be based on the needs, interests and concerns of pupils; that for this reason it cannot adhere to any strict, predetermined course of study; and that the problem or unit approach offers the most fruitful opportunity for achieving basic educational outcomes. That committee further pointed out that we must have teachers who understand children and who can adapt their teaching to the needs of the times. We subscribe to the same general point of view.

It is not our belief, however, that adoptions of this point of view excluded the possibility of making specific suggestions for methods or problems that might be considered by teachers and pupils in elementary schools. The resource unit, for example, can offer many specific ideas as to what might be done. These suggestions can be chosen, rejected, or modified in the light of the needs of the local situation.

We recommend, therefore, that local schools and representatives of city and state school systems work on the preparation of resource units dealing with problems related to the air age.

Thoughtful teachers will at once recognize that the problems of making air age education an integral part of general education is very much like that of integrating health, or conservation, or consumer education with our general efforts. 8

What are some of the changes that may occur in the curricula of the schools? Several definite trends are clearly discernible. Let us deal first with the elementary and secondary schools.

In March, 1945, it was reported that at least nine state

8 Ibid., p. 80.
departments had already issued courses of study in aviation education extending from kindergarten through junior college.9

The Department of Public Instruction in Nebraska instituted an aviation education program designed to start in the second grade of the elementary schools. This program, running through the secondary schools with increasing degrees in intensiveness, is carried on into the University of Nebraska in preparation for the teaching of pre-flight aviation.10

The files of language arts in the elementary and secondary schools, as well as in the colleges, will be influenced by the impact of aviation. Literature is now being published for courses in English which stress the adventure of travel in the airplane. One anthology of aviation literature for junior high school students includes such stories as Daedalus and his son Icarus, the magic carpet, the flying stool and the real-life stories of aviation pioneers.11

For the personnel of the airports a wide knowledge of foreign languages is of great importance. A large number of air officials at home and abroad come in daily contact with passengers from all parts of the world. Knowledge of foreign languages on the part of the air officials is highly desirable.12


10 Ibid., p. 443.


Aviation has come to the United States in a period when there are already great transportation systems in existence. Railroads, buses and trucks have vast networks of routes over this country, carrying many millions of passengers and large amounts of freight and mail each year. Likewise there are steamship lines from the United States to almost every country in the world. In addition, there are submarines, pipelines, bicycles, horses and other kinds of transportation. Now a new form of transportation, aviation, has come into existence.

Aviation is having a profound effect upon the institutions and peoples of the world. Technology has given mankind a vehicle capable of transporting men, their goods, and their ideas through aerial pathways at fantastic rates of speed. Frequently in the past, science and invention have speeded ahead of social adjustment, producing dislocations in society. The invention of the airplane and the discovery of atomic energy threaten to produce another period of social lag. Already aviation has influenced events and conditions of life and transformed old patterns of social living. Every objective of education, every social, scientific and economic area with which education deals has been affected. Education cannot ignore what is happening. Education can help to reduce the social lag.

Aviation is producing its most obvious influences on the objectives of specialized education. For a good many years professional schools and trade schools have recognized the opportunities for youth in aviation careers. Many secondary schools,
principally those with a technological aim, have offered preparatory and exploratory courses in elementary aeronautics and related subject-matter fields. The technological needs of aviation have been recognized, even though not fully met, by vocational schools and the specialized areas of secondary education.

But the present situation is more than one of occupational opportunities. School authorities and teachers also need a thorough understanding of the social effects of the airplane. The problem is one of general education. Pupils and teachers must develop new attitudes. They must have new insights in those fields where aviation has accentuated old tensions and conflicts between the peoples of the earth. Problems relating to America's national security and international relations must be re-examined in the light of aviation's impact upon modern life.

The airplane is a symbol of the changes and trends of contemporary life. In common with every other technological advance, the airplane emphasizes the need for better teaching of safety behavior and attitudes, for better teaching of democratic values and world understanding. Through the imperative and functional demands of new educational experience, pupil achievement in the fundamental skills will be stimulated. Methods of instruction and educational purposes must be considered and revised to meet the nature of modern living.
The airplane is also a symbol of the dangers implicit in every technological advance: a machine can be used for both good and evil. Therefore, youth should be educated not only to appreciate the airplane's power for good, but should also be educated to maintain intellectual and emotional balance in an ever-changing world situation. No better medium is provided for teaching this need for adaptation than aviation. If adjustment of our youth to these changes is achieved, the future is bright with opportunity.13

The phrase "air-age education" is used synonymously with aviation education and commonly refers to education for the world of today and tomorrow.

The term "aviation education" is commonly used for three types of school programs. There are, of course, many variations among these types.

1. Secondary school elective courses in the science of aeronautics are usually offered in the eleventh and twelfth grades, and are concerned primarily with ground school subjects of aerodynamics, navigation, meteorology, communications, and civil air regulations. During the war this type of course was taught in almost fifty percent of the nation's high schools. At the close of the war many schools, regarding it as preinduction training, dropped the course. Now the number may be

increasing because of the interest of many army air force or naval aviation veterans who have become teachers. The present world situation will undoubtedly encourage schools to organize courses in aviation education. In some schools through a few hours of flight, pupils have a laboratory experience to illustrate principles studied in class. Seldom, however, is pilot training a part of the high school course.

2. Prevocational trade school training of pilots or mechanics has been in the secondary schools for twenty years or more, not many such schools have developed programs in aviation trades. Some that have done so are C. A. A. certified; others have a connection with C. A. A. certified privately owned shops at fixed base operations. An increasing demand for pilots and aviation mechanics is expected, however, that will necessitate an increase in the number of prevocational courses offered throughout the country.

3. Materials of aviation fused into all subject matter areas at all school levels has helped to vitalize the curriculum with appropriate elements from the science of aeronautics and to inject the social implications of aviation into other studies. This change has been widely accepted by school administrators and classroom teachers. Isolated examples of such fusion in the science classes can be traced back to the year 1908. In the 1930's aviation units were set up for study at particular grade levels or in special courses. More recently the practice of introducing aviation materials into the
on-going pattern of learning experiences, wherever appropriate, has gained favor. The use of an aviation element in classroom work appeals to both the bright student and the dull.\textsuperscript{14}

In thirty-three states the state departments of education have published aviation education curriculum bulletins. Most of these publications have been issued jointly with state aeronautics commissions. In a number of cases, supplements have been published and in some instances growing interest has led to second or third editions.

There is a broad and active service program in the United States Civil Aeronautics Administration's Aviation Education Division. This service, with a small Washington staff and a field personnel consisting of one man in each of the seven C. A. A. continental United States regions, has been of assistance to states and city school systems in organizing programs of aviation education.\textsuperscript{15}

The United States has constantly been going forward in its industry, agriculture, business and social and economic life. Schools, of necessity, have had to keep pace and in this respect have turned their attention to air-age education. Our way of life is constantly changing, constantly growing. This change was seen when the railroad replaced the prairie schooner

\textsuperscript{14} Ibid., pp. 2-3

\textsuperscript{15} Ibid., p. 5
and the Pony Express. This change was seen when the automobile made the horse and buggy obsolete. This change was seen when the telephone and telegraph made distances of small consequence, and was seen again when the radio became a common means of communication.

Today America is on the verge of a greater change than ever before. This change involves the airplane and may have greater consequences and effects upon the world than any other previous changes. It is for this reason that our present school generation must be prepared to make proper adjustments to this new period in human history.

Montana has taken cognizance of this type of education and in September of 1950 began studying the problem in order that during the next year a program might be instituted for every school in the state. With such a program, pupils in every grade will be able to adjust their courses and studies in terms of the far reaching effects of this new mode of transportation.16

It is not expected that aviation will be taught in the elementary school as a separate subject, or even in many instances as a separate unit. Just as the airplane is having its effect upon many aspects of living, so it should be considered in many phases of the work of the elementary school. What is sought is

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16 "Biennial Report of the Dept. of Public Instruction". Helena, Montana, 1950, Air-Age Education, p. 34
a new emphasis in an existing program rather than an entirely new and separate program. It should not be supposed that the work on aviation will supersede or supplant a program of science in the elementary school, but rather will supplement it.\(^\text{17}\)

An adequate program of general aviation education could be provided by the incorporation of aviation-education objectives, experiences, problems, and materials into existing courses in the social studies, science, mathematics, literature, arts—-in fact, few existing courses are not susceptible to vitalization and enrichment by the inclusion of aviation problems and content. It is, therefore, urged that every effort be made by the schools to introduce aviation education into existing courses and activities in those situations in which the aviation content would vitalize and give increased significance to the content and activities of those courses.\(^\text{18}\)

The following is a list of suggested activities compiled by the School Service Bureau of the University of Wyoming:\(^\text{19}\)

1. Write a short history of famous aircraft flights.
2. Have class visitors interested in aviation talk to the class about their experiences.
   a. The local airport manager.
   b. Former airlines passengers.


\(^{19}\) Ibid., pp. 18-20
c. A pilot.
d. A mechanic.
e. The weatherman.

3. Plan a chart on the commercial uses of the airplane.

4. Make a large scale drawing of the home town including the airport, roads leading to it and listing the bus schedules and other transportation facilities to the airport. Give all information about the airport as to class, facilities provided, workers, etc.

5. Study the time zone changes and the use of the 24 hour clock.

6. Plot some geographical air routes and study flight plans and reports.

7. Compile a history of the United States Air-mail service.

8. On large air maps show the decided difference between surface and air transportation in relationship to:
   a. Distance.
   b. Time.

9. Prepare graphs showing time required to travel from New York to San Francisco by automobile, train, bus, ship, airplane.

10. Make a study of air traffic regulations, its history, purpose and present application.

11. Take the class on field trips to various related centers.
    a. Weather bureau.
b. The Airport.
c. An airplane factory.

12. Construct a model weather bureau, airport, control tower, etc.

13. Study air and air movements using pinwheels, bubble pipes, wind socks and vanes.

14. Make use of many audio-visual aids such as film, slide films, pictures, maps, globes, etc.

15. Ask for a copy of traffic rules used by airline companies. Compare with traffic rules for motor vehicle safety on the ground.
CHAPTER IV

METHOD OF RESEARCH
AND
SOURCES OF DATA

A complete review of all available material was desirable before attempting to obtain specific information for this paper. A great deal of the textbook material and unbound sources were found in the University library and the newly established curriculum library. Most of the material found proved to be of some value and provided a background for further study.

A great deal of the material used in this study was of recent publication. This can be explained by the fact that there was comparatively little written on air education prior to World War II. Much of the more recent material was in pamphlet form on file in the curriculum library. A considerable amount of this pamphlet material was left here by Mr. Bancroft, of the Civil Aeronautics Administration, during his visit here in 1950.

A questionnaire study was chosen as the means by which to secure the information needed. The questionnaire study was prepared in an effort to obtain a true picture of how air-age education was being presented in the junior high grades in Montana schools. A combination check list and opinion questionnaire was chosen because this kind of questionnaire could be easily filled out and would also provide additional information for a more conclusive response. The book by Good, Barr and Scates¹

was used as a reference and was followed as a guide in preparing the questionnaire. The first draft of the questionnaire was discussed with several students who had just completed the course, "Research and Thesis Writing", where they had acquired information on the techniques of constructing a questionnaire. It was also examined by several teachers in the Missoula grade schools. Several changes were made as suggested by responses given by these people. The final questionnaire was then drawn up.

On February 3, 1951, questionnaires were sent to elementary schools of first and second class school districts as listed in the Montana Educational Directory. A letter explaining the purpose of the study and instructions on how to answer the questions was sent with the questionnaires. The questionnaires were directed specifically to junior high school principals, whose addresses were obtained from the Montana Educational Directory. This was done for the purpose of finding out how air age education was being conducted in the upper grades of these schools. Four questions made up the questionnaire, the first dealing with a formal, prescribed course in aviation and air-education, the second and third dealing with integrating aviation subject matter with established courses. The fourth and final question asked specifically for opinions and suggestions on how an air age education program might best be conducted.

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2 See Appendix p. 53.

3 See Appendix p. 53
Many interesting points came to light on the fourth part of the survey which will be treated further in the next chapter.

Of the thirty-five principals who received questionnaires, twenty-six made replies. This showed a return of eighty-three and one-third percent, which is considered good by most standards. A total of twenty-six schools was left on which to base the information and conclusions in this study. The schools involved in this study were made up of the following grade combinations:

1. Grades 6, 7, and 8
2. Grades 7 and 8
3. Grades 7, 8, and 9

This variety in grade combinations is explained in part by the plan under which the school operates. Some of the schools surveyed have an eight-four system, some use a six-three-three-plan and some are under a six-six plan.

The twenty-six schools studied for this survey are as follows:

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<tr>
<th>First Class</th>
<th>Second Class</th>
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<tr>
<td>Anaconda</td>
<td>Great Falls</td>
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<td>Billings</td>
<td>Kalispell</td>
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<td>Bridger</td>
<td>Hardin</td>
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<td>Columbia Falls</td>
<td>Harlem</td>
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<td>Conrad</td>
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<td>East Helena</td>
<td>Lewistown</td>
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<td>Fairfield</td>
<td>Libby</td>
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<td>Whitefish</td>
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<td>Wolf Point</td>
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</table>
A first class district is one which has a population of eight thousand or more. A first class district employs a superintendent who has had at least five years' experience in public school work. This district is controlled by a board of seven trustees.\(^4\)

A second class district is one which has a population of one thousand or more and less than eight thousand. A second class district employs a superintendent who has had at least three years' experience in public school work. This district is controlled by a board of five members.\(^5\)

Of the twenty-six principals who returned questionnaires five failed to answer question four which was a very important part of the survey. It was possible, however, to use these returns for the check list questions were completed and supplied useful information.

In the final analysis, then, there were twenty-one completely answered questionnaires on which to base the information and final conclusions of this study. This represents a seventy percent return which is still a good return.


\(^5\) Ibid., p. 7.
CHAPTER V

ANALYSIS OF QUESTIONNAIRE RETURNS

In the analysis of the questionnaire returns an attempt is made to show what is being done in each school surveyed.

The first part of the questionnaire asked this specific question: "Do you offer aviation science or some other formal course in aviation in your junior high school?" Only one school indicated that such a course was being offered. This school explained that it was experimenting with a formal course in aviation in the eighth grade for two hours per week.

It is interesting to know that only one school of the twenty-six surveyed offered a course in aviation at the junior high school level. This may possibly be explained in several ways: aviation courses are almost entirely restricted to high school and college students; there is usually no room in the junior high school curriculum for such a course; teachers in the elementary and junior high schools are not trained to teach a course in aviation; and the cost of additional material and equipment would make it prohibitive in many schools.

There are undoubtedly many more reasons for the fact that more schools do not offer a formal course in aviation for their junior high school students.

In answer to the second question: "Do you integrate aviation subject matter with other courses?", eight schools indicated
that they did not. This clearly showed that eight of the twenty-six schools surveyed offered nothing at all in the way of air age education at this grade level. It is significant, however, that four of these eight schools commented on this particular question by suggesting that aviation education could be taught by integration with other formal courses.

The following comments from these schools will show more clearly what suggestions were made. Since these comments are quoted exactly as they were written on the questionnaire, the name of the school will not be used. Care has been taken in this study not to disclose the identity of the schools; therefore, names and locations are omitted. For the sake of clarity, however, these schools will be referred to by letters.

School A

Aviation should be integrated with geography, science and history courses in the grades and the junior high school.

I do not propose it as a separate subject since there are already so many subjects required put out by the State Department that it is impossible to meet the requirements without neglecting basic subjects.

School B

It can be easily integrated in the science of the eighth grade and in the social aspects of this study in social science. We do not have any formal instruction in this matter. Any information our youngsters would gain would be in a vicarious manner.

School C

I feel that this should be left for the senior high school curriculum, except in the study of vocations.
School D

Most likely one could do some good work in shop or some correlation in history, geography, mathematics and science.

The remaining four of these eight schools expressed the opinion that aviation education has no place in the junior high school curriculum.

The comments from these four schools are as follows:

School E

I doubt the advisability for pupils of this age. Any instruction would have to be incidental because of all the other things the public believes must be taught to pupils of this age.

School F

The junior high school program is now overcrowded. Forget it.

School G

The present junior high school curriculum is too overloaded to allow for any additional matter. We have only the seventh and eighth grades in our junior high school and I feel that this material is better presented in high school.

School H

Our junior high school consists of grades six, seven and eight. We have no such program for our school.

There seems to be no need for further comment on this for these remarks and comments are self-explanatory.

Questionnaires from eighteen of the schools surveyed clearly indicated that aviation subject matter was integrated with the regularly offered courses.\footnote{As shown in Table II p. 45.}
that these schools integrated this material with science. The number of courses with which aviation was integrated ranged from one to five. This clearly shows a wide variety of popularity of this subject in various schools. Of these eighteen questionnaires, thirteen had comments and suggestions on this type of program in general and briefly described how they were carrying on their programs.

These comments are stated as follows:

School I

I don't think a formal course in aviation should be offered in junior high school because of the number of courses already in the curriculum. I do believe, however, that it could be nicely integrated in the social studies, science, art and shop.

We offer a short unit in general science. The boys are especially interested in models of planes. We have several catalogues on models that are practically worn out.

I can also see a wonderful opportunity for this type of work in shop. In our system, shop is open to boys, and the classes are small with fifteen to twenty boys in a class.

School J

We find that this subject can be offered best in an introductory and elementary way in connection with junior high school science.

School K

We are in the process of revising our social studies curriculum. The new curriculum will include a certain amount of air age education.

School L

Our boys are interested in aviation and we find it very helpful to integrate this material with other subjects. I can't see how there would be time for special courses in the subject.
School M

I can see no great need, especially in small schools, for a formal air-age course. I can see, however, where there is a need for integration with the formal courses now taught.

School N

No attempt is made to emphasize aviation, but rather to correlate it with other subjects.

School O

Although we didn't just sit down and decide we would adopt an air-age program, we felt that it was an important and necessary part of our teaching if we were to teach the proper concepts of our modern world as to time distance, appropriate facilities and availability of material. By correlating past events with the present and using reference material in the regular subjects, we are able to present a vision of the meaning of the "air age" and show future possibilities.

School P

Every spring the entire student body is given the opportunity for a field trip to the local airport where they visit the Weather Bureau, Administration Building, Civil Aeronautics Administration and the Central Tower. This is followed up by a thirty minute plane trip over the dams in the river and around the valley. The students find this trip very educational and worth while.

The cost of the trip is set at two dollars per student and requires a total time of one and one-half hours.

School Q

We integrate aviation with our science classes only.

School R

In general we favor any program which will help familiarize students with air transportation and its effect on our lives, our policies, and our future.

Where personnel with experience or backgrounds in some branch of aviation science are not available, we prefer integration with other subjects.
School S

Our curriculum is in need of a change, as it is in most other schools. We are not practical in many subjects we teach.

Air-age education is offered in our school and should be offered in more schools.

School T

In our air-age program we stress the following:

1. New concepts of a global world.
2. Importance of air transportation and communication.
3. Elementary scientific principles of flight.
4. Importance of airplanes in peace as well as in war.
5. Need for international understanding.

School U

Our program, space and facilities are limited, therefore, whatever we offer in aviation must be done by integration.

From these comments and suggestions what may be sought is a new approach to an existing program rather than an entirely new and separate program. There seems to be a general opinion in these schools that aviation education should not supplant or supersede the existing program, but rather should supplement it.
TABLE I

TABULATION OF COURSES WITH WHICH AVIATION WAS INTEGRATED WITH OTHER SUBJECTS IN THE SCHOOLS PARTICIPATING

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<tr>
<th>School</th>
<th>History</th>
<th>Geography</th>
<th>Civics</th>
<th>Math.</th>
<th>Science</th>
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### TABLE III

THE NUMBER OF SCHOOLS WHICH INTEGRATE AVIATION WITH A SPECIFIC NUMBER OF SUBJECTS

<table>
<thead>
<tr>
<th>Number of schools participating</th>
<th>Number of subjects in which Aviation is integrated</th>
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<td>4</td>
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<td>4</td>
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<td>4</td>
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Read table in this manner: Of the eighteen schools who responded to question number 3, two schools integrated aviation with one subject, four with two subjects, etc.
CHAPTER VI

SUMMARY AND CONCLUSIONS

The primary purpose of this study was to make a survey of the junior high schools of Montana which were listed as junior high schools in the Montana Educational Directory for 1950-1951. Only those schools, which had a principal named as being in charge of the junior high school, were surveyed.

The purposes of this study, stated specifically, are as follows:

(1) to find out if any of these junior high schools offered a formal course in aviation.
(2) to find out if these schools integrated or united aviation subject matter with other courses.
(3) to find out what opinions or suggestions these junior high school principals may have on air-age education.

A summary of the findings of this study from the twenty-six schools surveyed is as follows:

(1) Only one of the junior high schools offered a formal course in aviation.
(2) Eighteen of the schools integrated aviation with other school subjects.
(3) Four schools clearly indicated that there was no place in the junior high school curriculum for air-age education.
(4) The remaining four schools indicated that the schools were in favor of some kind of air-age program but no-
thing was being done in air age education.

There are several limitations in this study which must be acknowledged. These limitations are as follows:

(1) The questionnaire method was employed to gather data for this study. The reliability of the findings depends on the quality of the questionnaire and on the conscientiousness of those who answered it.

(2) The data presented in respect to air age education programs and the principals' opinions and suggestions is based on seventy percent of the entire number of questionnaires sent to Montana junior high school principals.

(3) This survey covers only schools which were listed as having junior high school principals in the Montana Educational Directory.

(4) No follow up procedure was carried on with the questionnaire study.

Since the scope of this study was narrowed to a study of air age education in the junior high school grades in twenty-six Montana schools, certain related problems remain for future study. It seems, therefore, reasonable to suggest the following related problems for study:

(1) A survey should be made which would collect data from more schools.

(2) A similar study should be made of air age education programs at other grade levels.
A course of study on air-age education might be constructed for use in Montana schools. Although it is not the purpose of this study to determine what should be included in air-age education, it seems reasonable to make suggestions regarding an air-age education program.

Sound education for the air-age should not be altogether a matter of introducing new subjects into the curriculum. It is the opinion of the author that material on aviation should be integrated with the regularly taught subjects. The units in the appendix provide suggestions on how material on aviation may be integrated with regularly taught subjects. This approach seems to be in line with the best thinking today in the field of curriculum planning.


B. PERIODICAL ARTICLES

Ashby, Lyle W., "Education for the Air Age", *The Journal of the National Education Association*, (March, 1943), 74-75.

C. PUBLICATIONS OF LEARNED ORGANIZATIONS

Annual Report of the Civil Aeronautics Administration, 1939.

Annual Report of the Civil Aeronautics Administration, 1946.


D. NEWSPAPERS

The Billings Gazette, November 12, 1950.
As part of my graduate work at Montana State University, I am making an analysis of air age education offerings in the junior high school, and would like to enlist your cooperation in this study.

I am enclosing a questionnaire and a self-addressed envelope which I would like to have returned at your earliest convenience.

This questionnaire is very brief and should take only a minimum of your time for marking and answering.

Thank you.

Sincerely yours,

Roy C. Swan
QUESTIONNAIRE

1. Do you offer aviation science, aeronautics or some other formal course in aviation in your junior high school?
   Check X  Yes_____ Approximate hours per week_____  
   No _____

2. Do you integrate aviation subject matter with other courses?
   Check X  Yes_____  
   No _____

3. If you answered question No. 2 yes, check the following subjects with which you carry on integration.
   History _____  Mathematics _____  
   Geography _____  English _____  
   Civics _____  Art _____  
   Science _____  Shop _____

4. In the space provided below, I would like to have your opinion and suggestions on an air-age program in the junior high school.
GENERAL OUTLINE FOR AVIATION STUDY

Study of the Aviation Unit - Outline

I. Behavior of Air: Do many simple experiments on air pressure; air is real and can support things; air has weight; air expands when heated, etc.

II. Nature of flight: A. Seeds equipped to fly  
B. Animals equipped to fly

III. Kites

IV. Balloons—Lighter than aircraft

V. Parachutes and Paratroopers

VI. Why an airplane flies  Principles of flight:  
A. The wings - other essential parts of a plane  
B. The controls  
C. The engine and the propeller  
D. The instruments  
E. Meaning of terms as:  
   1. Dead Reckoning  
   2. Piloting  
   3. Celestial Navigation  
   4. Flying on the beam

VII. Ornithopeter - Autogiro - Helicopter

VIII. Gliders

IX. Performance of Planes

X. Identification of Planes

XI. Biology of flight

XII. Flight Weather

Materials

I. Set of charts called "Important Parts of a Mainliner" prepared by United Air Lines.

II. Free or inexpensive materials:  
B. "The Story of the Airship", Goodyear Tire Co.  
C. "Aircraft Instruments", by Killsmann  
D. "Pocket Aviation Quiz Book", by Miltin Figen  
E. "I've Got Wings", U. S. Army Air Forces
Procedure

Class discussion of charts and of books and current newspapers, booklets, oral reports on outside reading, reports by magazine clubs, special projects such as slides, models, and scrap books.

With the above as a background, organize round table groups to discuss the major points of the outline in their own classes, for other classes and for a special assembly.

Conclusion

The resultant stimulation of both those studying the Aviation Unit and their various audiences will prove that pupils of the eighth grade level can be vitally interested in Aviation as an important factor in their present and future lives.

Evaluation

I. Determine which of the desired goals the students have acquired by:
   A. Testing (objective)
   B. Class discussion
   C. Outcome of activities

II. Has the group improved in subject matter pertaining to the general area of the unit.

III. Is the group better socially adjusted:
   A. Does each individual make contributions to the whole?
   B. Does each individual accept an equal share of responsibility?
AVIATION UNIT
(For Eighth Grade Science)

Introduction:

The following unit in aviation is to give the teacher an idea of what can be done; it is not to be used as a daily guide. Each individual teacher must begin with her own group, learn the group's present knowledge of aviation, and begin from there to develop a unit adapted to the situation of her classroom. It is most important that the teacher have a good understanding of aviation before she begins a unit.

General Aims: To show that:

I. If America is to keep its place in world commerce, our people must become air-minded.

II. Aviation is rapidly becoming part of the daily lives of all of us, for the air pilot and the air passenger are as safe in the air as on the ground.

Objectives:

I. To indicate certain basic causes of weather and then to describe weather conditions and weather predictions of special importance to pilots.

II. To show the difference between lighter-than-air or light-flying machines and heavier-than-air flying machines.

III. To teach the parts of a plane and their use in flying.
   A. How they operate
   B. The simple principles

Specific Objectives: (For Weather Unit)

I. To give an understanding of the characteristics associated with weather.

II. To understand the relationship and importance of weather to safety in flying.
III. To learn the importance of the work of the weather bureau and the facilities available to the field of aviation.

IV. To develop ability in reading and using weather maps and similar reports.

Principal Materials:

I. Magazines

II. Free and Inexpensive Materials
   A. Various aircraft companies, United Air Lines, Transcontinental and Western Air Inc., Aeronautical Assoc., Parachute companies, U. S. War Department, etc.
   C. Hurky, Beatrice, The Story of Flying, Columbus, Ohio, American Education Press, 400 South Front Street, 36 pp. 15¢.

III. Books to Read
Pre-Unit Planning:

One unit for the eighth grade may be "Weather and Climate". This unit should precede the unit on "Aviation Science" for the weather is of great importance to pilots. In the study of the Air Ocean around our earth, it is quite natural to bring in the subject of aviation when speaking of such topics as troposphere and stratosphere, updrafts and downdrafts, thunderstorms and cloudbases.

Activities:

I. Visit a weather bureau airport station and make a list of all such instruments. Indicate where they are installed, such as, whether they are on the roof, in the office or near the ground.

II. Keep a record of the weather in your town for two weeks. Check the days which you think would have been good for flying.
III. Point out on the globe the equator and the North Pole. Trace the general direction of air from the equator toward the Pole.

IV. Tie a short thread to the end of a pencil so that the thread will hang straight down. Then hold the pencil over a warm radiator, and the thread will be lifted up by the rising heated air.

V. Borrow a barometer for use in the classroom. Watch it for several days. Keep a record of the changes in air pressure.

VI. Keep a notebook of new words and their meanings.

VII. The pupils may complete their study of weather with a science demonstration called "Weather and the Pilot", a dramatization written by the boys and girls.

Scene I Importance of Weather to Flying
Scene II The Pilot and the Weather (This scene shows a group of ten pilots who tell of their various missions in which weather plays an important part. Each child will write his own mission.)
- Pilot 1 -- Cloud Decks
- Pilot 2 -- Cirrus Clouds and Cumulus Clouds
- Pilot 3 -- Fog
- Pilot 4 -- Icing
- Pilot 5 -- Ceiling and Visibility
- Pilot 6 -- Thunderheads
- Pilot 7 -- Air Masses, Cold Fronts, Warm Fronts
- Pilot 8 -- Winds, Speed, Directions, Importance to Bombing Missions
- Pilot 9 -- Aerial Photography
- Pilot 10 -- Weather Reports, as sent to Pilot

Scene III Weather Station at Airport

Conclusion:

After this demonstration the pupils will see the importance of weather to flying. They could easily see the importance of aviation to the world. "How has the airplane changed our idea of world geography?" is a question which may stimulate the children to see that the plane has changed the course of history and that our future freedom and liberty depend on the supremacy in the air. They will see that in peace, the sky will be full of planes, filled with peaceful people traveling to far distant places, thus affecting our commerce, our relations with other peoples, and our world geography.
Seeing the importance of airplanes and aviation, the children will be most enthusiastic to start the unit on aviation. Children are already air-minded and, if through the study of this unit, they have learned that as future citizens of our country they could use the plane as a means of bringing closer relationships between all people of the world, then another objective has been accomplished.

**Evaluation:**

I. Testing

A. Questions to answer
   1. Why does an aviator need to know about the weather?
   2. What makes fog?
   3. How does a barometer work?
   4. What are the seven kinds of atmospheric conditions which make weather?
   5. What information must a weather bureau have before it can make an accurate weather report?

B. Words to know
   1. visibility
   2. ceiling
   3. meteorologist
   4. barometer
   5. humidity
   6. air current
   7. unlimited
   8. prevailing
   9. de-icer
   10. fog

II. Class Discussions

A. Discuss the seven kinds of atmospheric conditions which make weather.

B. Discuss the record of changes in air pressure from the barometer record kept during the week.