

THE  
FUNDAMENTALS  
OF  
AIR POWER

*An Address*

BY

JOHN C. COOPER

*With Introductory Remarks*

BY

JOHN DWIGHT SULLIVAN



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*The following are the texts of the introductory remarks and address delivered by Messrs. John Dwight Sullivan and John C. Cooper in the Coolidge Auditorium in the Library of Congress on the evening of January 7, 1948.*

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# Introductory Remarks by John Dwight Sullivan Executive Vice President, The National Air Council

LADIES AND GENTLEMEN:

Shortly before the close of the late war, a group of far-sighted and patriotic American citizens became convinced that the future security of this country would depend primarily and in large part upon the maintenance of American air power. They were further convinced that the maintenance of American air power rests upon a sound and informed public opinion. Upon these beliefs they established the then Air Power League, since become The National Air Council by reason of the affiliation of other organizations with the original group.

Their purposes in part and as set forth in the constitution of The National Air Council are these:

To develop public comprehension of the important role of United States Air Power in establishing and preserving world peace, and

To foster a broad understanding of the importance to national security of adequate United States Air Power.

It is in keeping with these purposes and policies that the Council, in cooperation with the Library of Congress, has sponsored this series of lectures, the second of which is to be given tonight. Having known our distinguished speaker for many years, it is a matter of personal pleasure to me to be given the honor of presenting to you Mr. John C. Cooper, who will discuss "The Fundamentals of Air Power."



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## Address by John C. Cooper

### LADIES AND GENTLEMEN:

Twenty-three years ago Brigadier General William Mitchell stated the first fundamental of air power: "Air power may be defined as the ability to do something in the air." Mitchell added: "It consists of transporting all sorts of things by aircraft from one place to another, and as air covers the whole world there is no place that is immune from influence by aircraft."

Today the world is in the midst of one of the great revolutionary periods of history. Mitchell heard the early rumblings of that revolution better than most men of his time. He died before it had reached today's crescendo. Institutions, standards, values—the basic foundations of national and international life a generation ago—are changing before our eyes. New forces have emerged gravely affecting our whole political, economic, and social structure. Of these forces, none is more potent than air power, for, as Mitchell said, "there is no place that is immune from influence by aircraft."

Our historic political territorial system has been based on the existence of surface boundaries, some natural, some artificial. Man has lived in communities connected or separated one from another by surface conditions. Until air power emerged as a world force, man moved about only on the surface of the earth. Nations traded by land and by sea, built surface armies and navies for their protection, fortified themselves behind rivers and oceans and mountains in fancied isolation and security. But those fine days have passed. Today nations are flying over those same rivers and oceans and mountains. The airspace has become a boundless highway for war or for peace, for destruction or for commerce. Which shall it be? That is our problem today.

Very recently one of our leading military authorities on the



use of air power, Major General Fairchild, Commanding General of the Air University, writing in the *Air University Quarterly Review* on the rise and fall of historic peoples, said:

The United States faces a state of insecurity in the future unparalleled in our history. . . . Unless we maintain clearly adequate air power in being, no matter at what sacrifice of goods and treasure, all else may well be futile.

Admittedly these are the words and the opinion of only one man. But they do indicate a sober and desperately serious point of view, with which I must say that I am personally in full accord.

What do we mean by "air power"? What are the factors and conditions which govern its existence, its growth, or its decline in this or any other nation? To what extent are these elements of air power within our control? Within the limited time available this evening I shall try to state very briefly some of my views on these questions. Whether you agree with these views is not important, but it is vitally important that air power be understood if we are to guard the Nation's future and have any real opportunity to restore lasting peace to this very troubled world.

Air power is the total ability of a nation to fly, to act through the airspace, to use controlled flight, such for instance as the flight of aircraft. Mitchell called it "the ability to do something in the air." Twenty years after Mitchell, General H. H. Arnold, in his last report as Commanding General of the United States Army Air Forces, pointed out that "air power includes a nation's ability to deliver cargo, destructive missiles, and war making potential through the air to a desired destination to accomplish a desired purpose"—that "air power is not composed alone of the war making components of aviation"—that "it is the total aviation activity, civilian and military, commercial and private, potential as well as existing."

Air power is, as I have said before, the total ability of a nation to fly. It provides the air transport of a nation in peace or in war, whether the cargo be passengers, mail, and freight,



or airborne troops and destructive missiles. This is the first fundamental of air power.

From it springs a second fundamental—that air power is indivisible. Military air force and civil aviation are supported by the same elements of national power. The same airfields can be used by civil and military aircraft; the same type of airmen can man either; the same brains can design and the same factories can build bombers and transports; the same materials and resources and fuel are required for their construction and operation. So long as a nation continues to possess these basic elements (to be discussed in detail a little later), its potential air power is not impaired, though some uses of its air power may be temporarily limited. For example, the vain effort made in the Treaty of Versailles to abolish German military air force while leaving practically unimpaired its so-called civil aviation, aircraft manufacturing industry, and German control of its own airspace proved tragically futile. One use of German air power was temporarily impaired but its potential air power remained.

That this was inevitable is obvious if we accept the truth of what I consider the third fundamental of air power. It is this. The air power of a nation will continue to exist so long as that nation has: first, the political right to fly and to control its own airspace, and second, the physical capacity to fly.

The three fundamentals of air power may be thus restated: first, air power is the total ability of a nation to fly; second, air power is indivisible—military air force and civil aviation are supported by the same basic elements of national power; and third, the potential air power of a nation will continue so long as that nation has the political right to fly and to control its own airspace together with the physical capacity to fly.

The extent of a nation's political right to fly is not a matter of abstract theory, but a very real international question. Let me explain very briefly what I mean by the political "right to fly." Prior to the Peace Conference of 1919, no agreement existed as to whether the airspace should be free to air navigation of all nations as the high seas are free to surface vessels, or whether the airspace over any nation is part of its sovereign



territory. As a result of World War I, the Paris Convention of 1919, one of the treaties growing out of the Peace Conference, ended the discussion. Since 1919 the nations of the world have recognized that each nation has complete and exclusive sovereignty of the airspace over its lands and territorial waters. Also, long before 1919 it was recognized that no nation has or could have sovereignty over the high seas, and that the navigation of the high seas was free to all. This is the doctrine of "freedom of the seas." The doctrine of airspace sovereignty carries with it the right and the power of every nation to control the airspace over those parts of the earth's surface under its sovereignty, and to admit or exclude any foreign aircraft from that airspace. The same doctrine in connection with the rule of "freedom of the seas" says in substance that, as there can be no national sovereignty of the high seas, every nation has the equal right to fly in the airspace over the high seas of the world. That this principle of airspace control is of basic importance in any consideration of world-wide air power is well illustrated by the fact that the Soviet Union, for example, includes within its sovereign territory about one-sixth of the land surface of the world. It, therefore, has the complete and exclusive control of an enormous amount of the world's navigable airspace. In that airspace it has the sole political right to fly, while at the same time it enjoys with every other nation equal right to fly in the airspace over the oceans that lie between the Soviet territory and such other nations.

Historically the importance of the political elements of air power is best illustrated by the collapse of the air clauses of the Versailles Treaty ending World War I to which I have earlier referred. By that treaty, it was provided in most positive terms that "The Armed Forces of Germany must not include any military or naval air forces." This prohibition was to continue so long as the treaty existed. The intent to disarm Germany in the air was plain, but the method employed was destined for certain failure. The treaty left with Germany, after January 1, 1923, control of German airspace. Civil aviation and aircraft manufacturing were little impeded. The German Government used as a bargaining weapon this right to control its



airspace and to admit or exclude foreign aircraft. In the end it admitted the aircraft of its former victorious enemies only under an arrangement which resulted in the complete collapse of the controls which were intended to enforce the permanent disappearance of German military air force. The Luftwaffe was built, Hitler summoned Chamberlain to Munich, and World War II was fought, although to this day the unabrogated clauses of the Versailles Treaty of 1919 still provide that "The Armed Forces of Germany must not include any military or naval air forces."

The fundamentals of air power must not be misunderstood again. If we have reached a fixed determination that Germany and Japan must be prevented from rebuilding the air forces which came so close to providing an Axis victory in World War II, then the potential air power of Germany and Japan must be destroyed. To do this, we must provide complete international control of German and Japanese airspace and the right to fly in that airspace. We must also control so far as possible German and Japanese capacity to fly.

The political right of a nation to fly and its capacity to fly are very different things. Both must exist in any nation which lays real claim to air power. Even though a nation may be sovereign in fact as well as in name, complex conditions, over some of which it has no control, may seriously affect its capacity to fly and therefore its air power. On the other hand, a people not recognized as sovereign may have great capacity to fly but be without air power due to lack of the necessary political right to fly. Such was the status of India, which certainly had the capacity to fly before its colonial status ended and its present political status was attained.

The elements of a nation's capacity to fly are of two kinds: first, assuming that it has a right to fly, those which determine its present usable national air power, and second, those additional elements which measure the potential air power of a nation over a long period. In the first class I would include *aeronautical industry, aeronautical facilities, the civil air establishment, and the military air establishment*. Aeronautical industry (including the aircraft manufacturing industry, engi-



neering, and research) furnishes the air fleet and its necessary replacements. Aeronautical facilities (including airports, maintenance, and air navigation aids) provide the physical operating requirements without which the civil and military air establishments would be useless. These elements of a nation's capacity to fly and therefore of its air power have several things in common. They are visible and acquired national assets. Together they will provide the national air transport in its widest sense, whether in peace or in war. If any one of them is deficient, national air power suffers.

The civil air establishment must be sufficient to provide the needs of a nation's air commerce in time of peace and a reserve of aircraft and airmen in time of emergency. The military air establishment must be adequate to maintain the peace and defend the nation from any possible aggression. Both aeronautical industry and aeronautical facilities must be adequate to serve the needs of peace and capable of such immediate and practical expansion as any foreseeable emergency may require.

I would not be frank if I failed on this occasion to direct your attention to our apparent lack of appreciation of the importance of air power as appears from the present status of certain of these elements of national air power applied to our own country. Of the military air establishment in the United States I can say nothing. I do not consider myself either by training or otherwise capable of analyzing its present position or its requirements. I do, however, refer you to the published statements of many able and responsible experts expressing their concern and alarm.

As to the civil air establishment and as to the necessity of its maintenance in a sound and healthy condition, I would refer you to a recent statement of the Air Transport Association, comprised of the great airlines flying the United States flag. This statement indicates that the domestic airlines of the United States suffered a loss of approximately seven million dollars in 1946 and that the loss for 1947 will probably be in excess of that amount. In appraising the present air power position of the United States I do not think that these figures can be ignored.



I would also refer you to a recent statement of the Aircraft Industries Association to the effect that "interim financial reports issued by major aircraft and engine companies indicate that the operating loss of the fifteen major concerns for the 1947 period will approach \$100,000,000, compared with an operating loss of \$81,591,000 reported by the same companies for their 1946 fiscal periods," and that the "net loss after tax carrybacks and application of postwar reserves and other credits for these fifteen companies in 1947 will more than double the \$11,684,000 net loss after all carrybacks and credits they experienced in 1946." If, as I feel, the maintenance of an efficient air manufacturing industry is absolutely essential to the continued capacity of the United States to fly and therefore to its air power, I would urge that these figures be given the most careful consideration in assessing our present air power position.

Vital as are these elements of present national air power, there are certain conditions which together with these elements determine the long-range potential air power of a nation. So much has been said and written about the visible elements of air power, the military and civil air establishments, aeronautical industry, and aeronautical facilities, that we have lost sight of those underlying factors which make possible the continued existence of air power over a long period of time. Included in those conditions which affect the potential air power of any nation, I would suggest: (1) geographic conditions, including among other things location, size, physical conformation, climate, and weather of national territory; (2) resources, both economic and material; (3) population, including size, educational level, and adaptability for aeronautics; (4) industrial development; and (5) political conditions, including national incentives and government policies. Time will not permit me this evening to discuss more than a few examples of how these factors affect the potential air power of the United States and some other nations.

Consider, for example, the status of France at the date of its liberation. It had neither air fleet nor aircraft industry, and its air navigation facilities were largely destroyed, but France had regained political control of its own airspace and still had



national characteristics which gave it great potential capacity to fly. Its air power still existed. Neither Germany nor Japan has today any of the visible elements of air power, but each of them has still many of the national assets on which were built the air forces of World War II. If the final treaties of peace leave to either of them the control of its own airspace, potential air power will certainly exist.

No national asset is more important to air power than the size of a nation's territory. This is particularly true if national territory is included in a single land mass. Every nation has the right under the doctrine of airspace sovereignty to reserve for itself air traffic in its own territory. The larger the national land mass, the more the internal air traffic of the nation is developed, thus building a reserve supply of aircraft usable elsewhere in an emergency, as well as the aircraft maintenance and manufacturing industries needed to support its internal aviation, together with the trained airmen and ground crews, navigation facilities, and airports. Air power builds and rebuilds itself. As a nation increases its national flying the greater becomes its actual air power as well as its potential air power, and the more easily can it expand its air establishments, industry, and facilities in time of emergency.

The location of national territory also directly affects its capacity to fly and its air power. Of any two nations, otherwise equal, that nation will have the greater air power which is so located that it can normally reach the larger number of its foreign air objectives with less flying and by more direct routes, particularly if such routes need not cross intermediate foreign territory. The length and location of a nation's ocean boundaries are therefore of the greatest importance. Over a boundary separating national territory from that of another nation aircraft may fly only when political permission has been obtained. But over boundaries facing the sea a nation has complete freedom of air action and may fly when and where it wishes.

As I have already stated, the territory of the Soviet Union occupies approximately one-sixth of the land surface of the world. In area it is approximately equal to all of North Amer-



ica. From the Black Sea in its southwest corner to Bering Strait separating the Pacific and Arctic Oceans at the northeast corner is approximately the same distance as from Seattle on the Pacific to Paris beyond the Atlantic. The Soviet Union has the longest shorelines in the world. While the thousands of miles of its Arctic shores may be useless as an asset of sea power, they are not useless as an asset of air power. Its aircraft may fly northward across the Arctic toward Greenland and Canada and eastward across the Pacific toward Alaska and continental United States as and when they wish. The geographic air power potential of the Soviet Union is quite beyond that of any other nation. Aircraft with a one-way range of 5,000 miles, flying from bases within this single great Soviet land mass, could reach any point in Europe, any point in Asia, including Japan and the Netherlands East Indies, any point in Alaska, Canada, continental United States, most of Mexico, and any point in Africa as far south as Johannesburg in the Union of South Africa. From Soviet airfields in northeastern Siberia it is only 1,250 miles to Fairbanks, Alaska, 2,500 miles to Seattle, 3,500 miles to Los Angeles, and 4,000 miles to Chicago. From an airfield on the Soviet central Arctic coast aircraft with a one-way range of 4,500 miles could reach all of Canada and any point in the northerly part of the United States, including Seattle, Chicago, and New York.

The geographic air power position of Germany was and is excellent. While its comparatively small size necessarily limited its internal flying, its central position at the crossroads of Europe gave it tremendous advantages. These were fully realized in the development of its international civil aviation prior to World War II and in the use against its neighbors of military striking force during World War II.

The geographic air power position of the United States is quite unique. Its continental land mass as well as its industrial resources have fostered the development of the greatest existing civil aviation. Its boundaries on the Atlantic Ocean, the Gulf of Mexico, the Pacific Ocean, and the Arctic Ocean and Bering Sea (through Alaska) give it great freedom of action. It is handicapped, however, by the fact that Alaska and Hawaii



(two of its most important air power geographic factors) are physically disconnected from its main land mass. Aircraft are quite useless for military or civil purposes unless they can be kept adequately supplied with the necessary fuel and replacement parts. Aircraft located in Alaska or in Hawaii or in any other outlying bases which the United States may maintain suffer from this handicap.

Although geographic conditions are important, they alone do not determine potential air power. Other national factors are directly involved. Not the least of these are the economic and natural resources available for the construction, operation, and maintenance of air fleets, military and civil, together with the necessary airports and other ground facilities. I cannot impress on you too strongly that any nation which must import its completed aircraft or necessary parts and accessories, is almost fatally deficient in potential air power. In time of emergency such importations might be prevented and replacements would cease, with fatal results to the military and civil air establishments.

Almost as important is the status of the raw materials needed to construct aircraft, aircraft engines, and parts, as well as the fuel required for their operation. This is one of Great Britain's real air power handicaps. Practically any kind of material that goes into the construction of its aircraft and all the petroleum products needed for fuel and lubrication in its aircraft engines must be imported from far overseas. In this respect both the Soviet Union and the United States have certain advantages. The petroleum industry of the Soviet Union has certainly expanded, and I am personally inclined to think that it can now rely on its internal sources of supply for aircraft fuel and lubrication without importation. The Soviet Union is, of course, handicapped by very difficult inland transportation conditions in northern and northeastern Siberia. It must be recalled, however, that the great Siberian rivers which flow from south to north are open during part of each year and that the Trans-Siberian Railway crosses each of these rivers in southern Siberia, thus providing combined rail and water transportation for supplies to the Siberian Arctic coast. Also, with the use of



efficient icebreakers the Soviet Union has developed summer seaborne traffic as another source of supply for its Arctic territory.

The metallurgical resources of the Soviet Union are very little known. Within the last few years they have certainly been tremendously developed, and the Soviet Union is probably approaching self-sufficiency in the matter of materials needed for the construction as well as the operation of its aircraft.

The raw material position of the United States has been a matter of serious debate. It is quite impossible to review it at this time. Suffice it to say that in the construction of modern aircraft certain light metals are necessary and also certain scarce metals for the required alloy steels. Last year I made a study of this problem with the result that I found that the plans for the construction of one type of modern high-speed transport aircraft indicated that the materials to be used would be approximately 58 percent aluminum and 34 percent alloy steel. It is my information that the United States is deficient in and must import certain of the metals needed for these alloys. As to our supply of aluminum, without which I do not believe we could maintain an adequate air fleet, I call your attention to the language of a report as to the wartime use of strategic raw materials made by a special Senate committee in 1946. Aluminum is a refined product of what is known as bauxite. The Senate committee said that "the United States never had large resources of bauxite, except in the State of Arkansas. These fields were large enough only for a year or two of production at our maximum rate. We are, therefore, dependent for our supply of bauxite on South America in particular, and to some extent on the Pacific areas. Unless we can develop new industrial methods . . . the United States will always be dependent in this very basic industry on its ability to import from abroad."

Petroleum products are needed for aircraft fuel and lubrication. Raw rubber is needed for aircraft tires. If the air power of the United States is to be maintained, adequate supplies of these basic materials are absolutely necessary. The United States has been in the past the greatest producer of petroleum. Whether we have already arrived at the time, or whether we are



approaching the time when we must depend on importation of petroleum products, is a subject of wide debate. As to rubber, we certainly must rely on the imported raw product unless we maintain our capacity for synthetic production developed during the war.

Maintenance of air power for the future requires the most careful consideration as to the sources from which the United States will obtain the needed raw materials, metals, fuel, rubber, and all of the other products required for the construction and operation of aircraft. To the extent that stockpiling may be necessary, it must not be neglected. To the extent that the manufacture of synthetic products will be required, we will forget it at our peril.

But the construction, operation, and maintenance of aircraft involve more than material. They also require manpower. The population characteristics of any nation will affect its present and, even more so, its future air power. Aviation calls for young men and women. Particularly in the operation of aircraft, youth is a major factor, and to some extent this is also true in the manufacturing and maintenance processes. The educational level of the population is also a matter of importance in considering air power problems. For no other industry requires higher overall technical skill than does aviation, whether it be manufacturing, operation, or maintenance. On the other hand, a nation which has a very large number of youths from which to pick may have real advantages, even though the educational level and technical skill of its inhabitants might be below that of another nation of fewer inhabitants. If we would compare the future air power potential of the great nations of the world, I would call your attention to these provocative figures. In the last prewar census there were approximately 170 million people in the Soviet Union. Of these it was estimated that 36 percent or approximately 61 million were then fifteen years of age or under. At approximately the same time there were about 190 million people in the English-speaking nations, comprising the United States, Great Britain, Canada, and Australia. But of this 190 million, a little less than 25 percent or about 46,500,000 were fifteen years of age and under.



The Soviet Union lost heavily during World War II. Since 1939, however, additional territory has been added to the Union, and it has been estimated that its present population may be about 200 million with a normal increase of about 2,800,000 per year. From these figures it appears that the Soviet Union has a very large percentage of young men and women, and that either now or in the very near future the number of Soviet youth may be twice that, age for age, of the youth of the United States, Great Britain, Canada and Australia combined. May I suggest that these questions of population cannot be overlooked in assessing world air power problems.

Air power, of course, requires more than materials and men. The whole complicated economic structure of a nation and its technological ability are also involved. As I have said earlier, aeronautical industry in being at any particular time is one of the vital factors of usable air power. Even more important as an element of potential air power is the national ability to maintain that industry and to continue its technical advance, and to be able in an emergency to increase many times its output capacity. After World War I, Germany, through the high technical level attained by its industries and the energy and training of its engineers, rebuilt its aeronautical industry. The United States in World II saw its aircraft industry expand until it became the largest industry in the country. In 1938 we built less than 7,000 aircraft. Very fortunately on that occasion we had the time to expand our industry before we became engaged in active hostilities. In 1944 we built almost 100,000, including fighters, bombers, trainers, and transports. Following that peak period, production slumped dangerously in the postwar recession. In 1946 the same industry produced only 1,330 aircraft. The recently published statement of the Aircraft Industries Association indicates that the output in 1947 will be approximately 1,800, of about the same total airframe weight and dollar value as the 1,330 aircraft produced in 1946. This is the industry which also reported a possible one hundred million dollar operating loss in 1947. These figures speak for themselves.

Of the long-range factors which may control the growth or



decline of national air power, none, however, is more important than the attitude of the government which has the responsibility of directing a nation's activity. Perhaps little can be done about the territorial status of a nation or the numbers of its population or the natural resources within its borders. These factors are more or less fixed and out of our control. But otherwise the attitude of a government may be decisive. A nation may have every other element of air power but still lag behind if its government has no real urge to insure its future development. The attitude and actions of government will fully determine the size of our military air establishment, and greatly affect the efficiency of our civil air establishment, our aeronautical industry and facilities—hence our air power in being. The same attitude may also determine our ability to take advantage of those national conditions which aid our long-range potential air power as well as to improve those conditions, such as the waste of natural resources, which threaten our future. For we must face the facts for the future.

But government alone can not be responsible. We ended World War II with the greatest military and civil air establishments then in existence, the finest aeronautical industry, and worldwide aeronautical facilities. Our air power in being, military and civil, was then unassailable. Our potential capacity to fly is, in my judgment, unequalled even today. To maintain this leadership and realize these potentials is the problem of our people, our industry, and our government. Planning for the future is a most complex matter, and in no field is it more complex than when dealing with air power.

Air power is today the most dynamic force in the life of nations. Properly used, it can be the means to better understanding among the people of the world. Improperly used, it can be a threat to the general security even in time of peace. If war comes again, air power can transport the armed forces and missiles fated to destroy our civilization. I submit to you that we cannot afford to ignore the lessons of history. We must realize that air power is the ability of a nation to fly; that air power is indivisible, used at times for civil air transport and at times for military striking force; and that air power will continue to exist



as long as a nation has the political right to fly and to control its own airspace, and as long as it vigorously and consciously maintains its capacity to fly. These are the fundamentals of air power.



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