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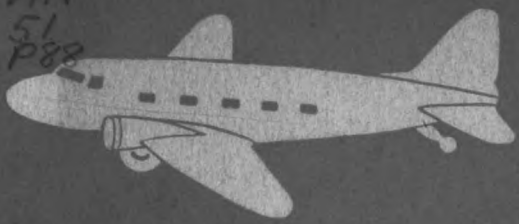

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PUBLIC AFFAIRS PAMPHLETS

THE AIRPLANE AND TOMORROW'S WORLD

BY WALDEMAR KAEMPFFERT

What is the future of the glider and the helicopter?

Will the airplane destroy our cities?

Should a nation seek to control "its air"?

PUBLIC AFFAIRS PAMPHLETS
No. 78 1943

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THE AIRPLANE AND TOMORROW'S WORLD

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By WALDEMAR KAEMPFFERT

OUT of the bomber of the last war came the commercial transcontinental, transoceanic airplane. Out of the bomber of this war the giant cargo and passenger airplane of the immediate future is already emerging. In little more than ten years after Lindbergh's lone flight across the Atlantic in 1927 the world was covered by an aerial web that stretched from Amsterdam to the Dutch East Indies; from London to Singapore and Cape Town; from New York to San Francisco and to South America. And now such prophets as Major de Seversky foresee a winged colossus with a range of perhaps 15,000 miles.

Waldemar Kaempffert, the author of this pamphlet, is Science Editor of the *New York Times* and is author of many popular articles on scientific subjects.

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We owe this remarkable development entirely to war. Although the early inventors of airplanes received little help from their governments, the first public flights of the Wright Brothers in 1908 made a deep impression. It was evident that a new and powerful weapon had been created. Government research laboratories began to seek ways for improving this weapon. But the most productive of all laboratories was the battlefield. Before the outbreak of war in 1914 the airplane was still a crude conveyance; after 1918 the first transatlantic flights were made and passenger carrying by air became a commercial enterprise.

THE AIRPLANE OF THE FUTURE

THERE is a limit to the size of an airplane. What the limit may be is not easy to determine. Dr. Roxbee Cox has shown that a gross weight of 250 tons is attainable and one of 650 tons possible. Some authorities even maintain that there is no limit. Whether or not there is, we must certainly reckon with planes that will dwarf anything that we have today. We must also reckon with their immense range. "Draw a line 6,000 miles from our eastern and western shores," de Seversky bids us. "It will embrace all the major industrial centers and all the major sources of raw materials in the world. A 10,000-mile radius brings the capitals of all the major countries within striking distance of Alaska and the North American continent." This is a far cry from the Air Transport Command's C-54, a four-engined transport-cargo plane which at most has a range of some 4,000 miles and which can carry for shorter distances a pay-load of some ten tons.

More research must be conducted, new designs and alloys must be worked out, engines of much greater power must be available before we can exceed even the 125-ton "Mars" built by Glenn Martin. Yet when we remember that in 1903, at a time when the Wrights were making their first flights in secret,

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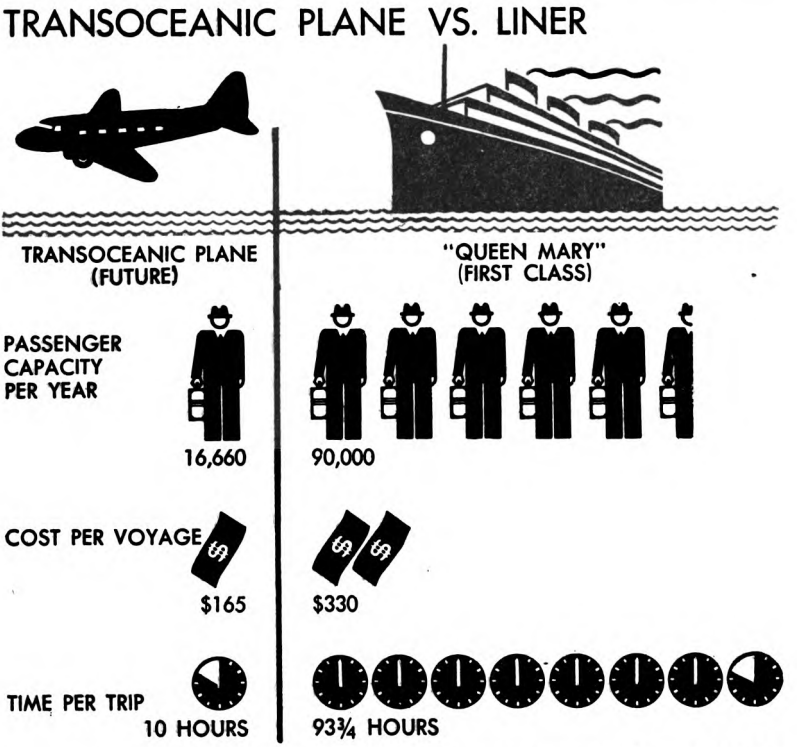
Professor Simon Newcomb published an article in which he proved to his satisfaction that the airplane had no chance because its supporting surface increased out of all reasonable proportion to the load that it was required to carry, it is rash to



dismiss 250- and 650-ton leviathans as impossible. We certainly have every reason to expect that planes for 150 passengers will appear soon after the war. A dozen of these could carry as many passengers on the North Atlantic run to Great Britain as were carried first-class by all steamers in an average year between 1928 and 1938. Two such planes flying every day in each direction could carry 200,000 persons a year. The Queen Mary can carry only 90,000 in 48 possible annual voyages, without allow-

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ing for time that should be spent in a dry dock. Frequency of schedule rather than a range of 10,000 miles or more is the key to future operations of commercial planes.

The first giant planes to appear after the war will probably have a ceiling no greater than the C-54's 35,000 feet—a ceiling which barely lies in the lower stratosphere in some latitudes and which is attained with supercharging. Then will come the true stratosphere plane. It will have a sealed cabin within which the pressure will be that which prevails at 10,000 feet. The purity of its air will be maintained by oxygen regulators. It will climb at the rate of four miles a minute out of sight of ocean and land. It will be an ordinary event to breakfast in New York and lunch in Southampton or Portsmouth. With more highly developed Diesel engines than we have now, the cost of a flight to Great Britain should be less than that on a fast steamer. For $165 it is even now possible to fly practically as far as from the United States to Great Britain.

THE NEW GEOGRAPHY

SUCH huge, long-distance planes will compel us to learn geography anew. Although we have known for some centuries that the earth is a globe, we still rely on flat Mercator maps. In these the shapes and areas of continents are grossly distorted. Suppose that a plane were to fly from Tokyo to Panama. Would it pass east or west of San Francisco? According to the flat Mercator map it would pass well to the west of San Francisco. But the pilot would actually pass to the east if he followed the shortest route. All of the Pacific coast cities from Panama to Portland lie close to the route to Japan and the Orient. On a flat map the shortest distance between any two points is a straight line; on a globe it is the arc of a great circle. On a Mercator projection map the shortest course between Washington and Tokyo lies on a line that crosses the United States close to San Francisco. But the air pilot flies on a great circle

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northwest over the Great Lakes through Canada, passes Fairbanks, Alaska, skirts Siberia, and thus reaches Japan. Anne Lindbergh compressed all this into a few words: "You fly to the Orient north, not west." The shortest route to Chungking is over Alaska, and the shortest to Moscow just misses Greenland.

By air, San Diego is only a little nearer Japan than Minneapolis. Mercator's projection is fairly accurate only for a subtropical band some 45° above and below the equator. If the figure of a man were projected on a flat sheet of paper in accordance with Mercator's principle his legs would fan out grotesquely and his head would appear as an enormous inverted cone. Mercator and others who followed him assumed that the globular earth must be pictured from a single point of view, something impossible technically and politically.

For navigation at sea this distortion is of no great moment. Any straight line drawn in any direction crosses parallels and meridians at a constant angle. Since meridians run true north and south, a straight line that crosses them all has a constant bearing. A sailor has but to plot his bearing on a Mercator's chart with a ruler to know at once what his course should be. For this reason Mercator's projection will always have its uses on slow ships.

An absolutely correct representation of the earth is possible only on a sphere. Hence a correct map cannot be drawn on a single sheet of paper. Tailors and dressmakers are quite aware of this when it comes to making patterns. To meet the needs of the new air-world, several types of flat maps must be used for different purposes—one for flying, one for meteorology, one for political and economic reasons.

The Mercator projection, which was devised for the convenience of ocean navigators, taught us to divide the world into eastern and western hemispheres. Now we must learn to think of the northern and southern hemispheres, partly because the Russians have demonstrated the practicability of transpolar flying, partly because the shortest route to much of

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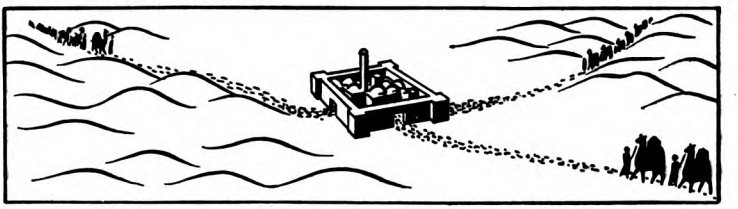
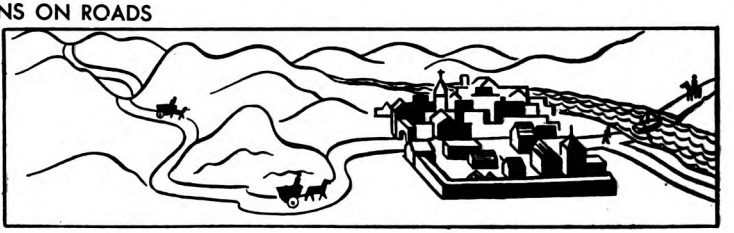
SETTLEMENTS FOLLOW TRANSPORTATION DEVELOPMENTS

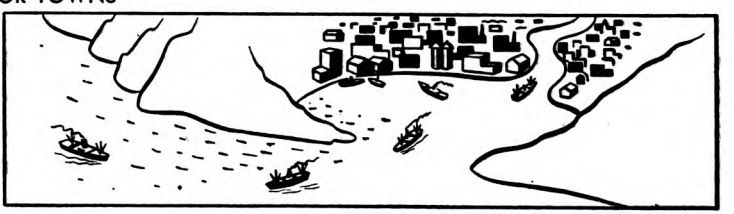
TOWNS ON CARAVAN ROUTES



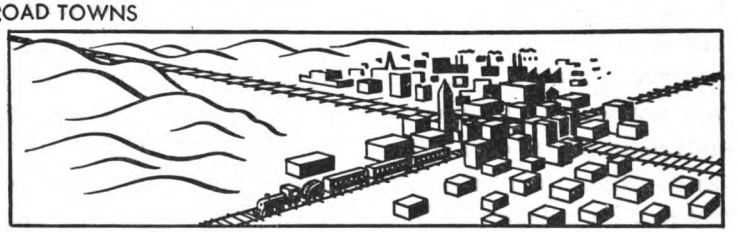
TOWNS ON ROADS



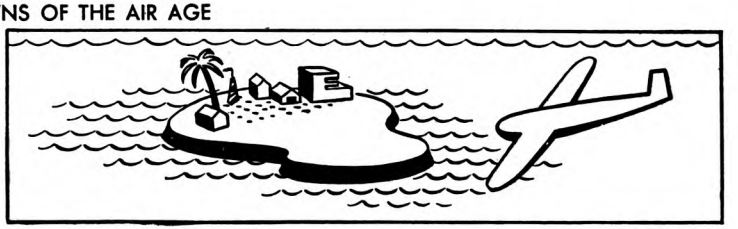
HARBOR TOWNS



RAILROAD TOWNS



TOWNS OF THE AIR AGE



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but which were appropriated and settled by the United States under international law when it was discovered that they were uninhabited. In a sense the history of the ancient trade route is repeated—the history of communities that owed their prosperity to the caravans that once passed through them. The caravans today have wings. Mountains, oceans, shore lines, deserts—these are no longer serious obstacles to free movement.

GLOBAL ECONOMIC EFFECTS

IT follows from all this that the giant airplane to come will open new markets in undeveloped parts of the globe. Not many years after the conclusion of peace it will be possible to deliver clothes, medicines, books, radio sets, furniture to any place in the world in twenty-four hours. An airport is not always essential. Goods can be dropped by parachute upon an open space or conveyed by helicopter taxi service from an airport 100 to 200 miles distant. Perishables that can now reach a market only in a refrigerator car will find far-distant buyers. We have only to remember that Europe is now but six hours away with the fastest bomber, and that no two cities on earth are separated by more than 48 hours of continuous flying. Both the steamship and the railway company will benefit; for as a once distant and obscure community develops because of its importance as a way station for airplanes, its growing population will demand more and more of the outer world's heavy goods, machinery, and bulk commodities. The economy of every industrial country will be quickened. But the slow steamer and the railway will always be needed to transport bulk commodities or very heavy cargo.

Business Methods Revolutionized

Although long-distance transportation by air has scarcely started, its social and economic effects are already apparent. Banks, for example, have found that when weeks can be

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reduced to days, funds can be more rapidly turned over because of the readiness with which documents and bills of exchange can be sent to their destination. Before the airplane three weeks were required to send mail to Buenos Aires from New York, with the result that international trade was handicapped by a six weeks' delay for the exchange of letters. Now Rio and Buenos Aires can be reached from New York in three and a half days.

A correspondent of the Christian Science Monitor in New Zealand wrote in January, 1940:

> Though the empire airmail had been operating for only a year—it began when the *Calypso* took off from Southampton, July 28, 1938—it had caused a revolution in business habits. Halving the time which was needed for letters to reach the other end of the Empire stimulated correspondence to an extraordinary degree. It helped firms established in Britain and New Zealand to hold conferences on important aspects of their business without much loss of time. Prominent members of firms at the Antipodes could fly to India in a few days, there to meet colleagues who had flown from Britain along the regular airmail track, and thus halve the travel time.

All the great western powers and most of the international corporations have similarly used the airplane to quicken the process of administrative communication. Long before the war, British, Dutch, French, and Italian officials and business executives traveled by air frequently and widely to make tours of inspection and to hold conferences. A colonial administrator or the representative of a European or American company no longer feels that life in the Far East or South America is a form of self-imposed exile to be terminated only when he reaches the age of retirement. Instead of an eight months' leave of absence once in six years, short annual leaves are now almost the rule.

The effect of the airplane on primitive peoples has been well brought out by Dr. Charles Camsell, Deputy Minister of Natural Resources of Canada. As an explorer he traveled three

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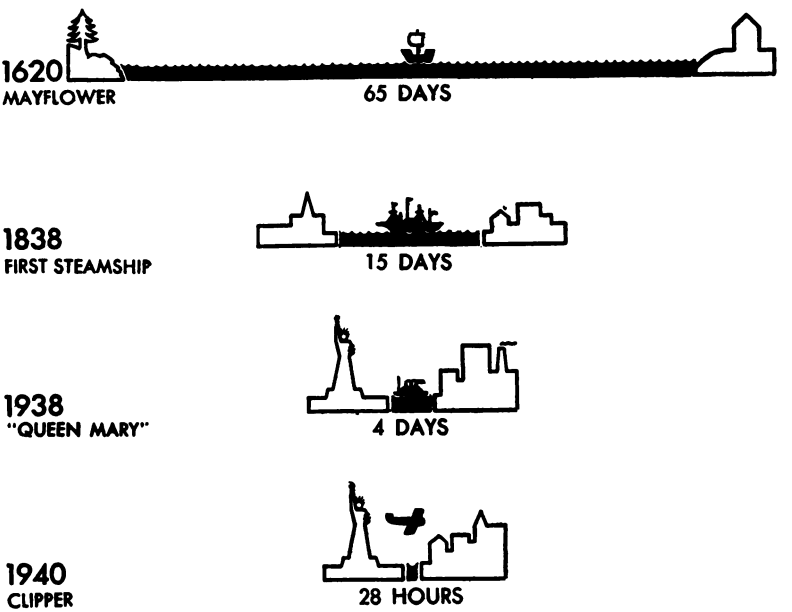
and a half years (1899-1903) on foot and in canoes over 1400 miles in the Arctic. Thirty-five years later he covered the same route by airplane in ten flying days, stopping overnight. On his first journey he discovered a tribe of Eskimos who had never

SHRINKAGE OF THE OCEAN



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seen a white man and who had no iron. Their lances were barbed with walrus ivory; their light came from open seal-oil lamps with wicks of reed-piths; their knives were sharpened walrus tusks; their clothes were of skin sewn with caribou sinews. In a word, they lived in the stone age. On his second visit he found the men equipped with repeating rifles, outboard motors, sewing machines, and cameras, all transported by plane. Some of the women even wore corsets.

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EFFECT ON THE NATIONAL ECONOMY

THAT the airplane will also affect our mode of doing business nationally is already evident. Although he may be hundreds of miles from a factory, a small automobile dealer now telephones for a part in the morning and receives it the same day. As the cost of sending valuable or urgently needed goods by air is reduced, the middleman will lose some business. Articles of high value will be distributed directly by the factory. That this is no wild dream may be seen from a staff report of a large railroad company, in which it is stated that the total volume of goods now suitable for transportation by air amounts to about 20,931,000 tons yearly—about 2,000 times as much as all the express packages carried by American airlines in 1941. Imaginative engineers predict small airports at factories.

Particularly striking is the development of aerial freight traffic in what we call "backward countries." In 1938 the Soviet Union carried 47,841 tons by air; we only 4,786; New Guinea, 13,085; Canada, 9,697; Honduras, 7,539; Columbia, 6,150. The relative showing of the United States and the "backward countries" is highly significant. In Central America, T.A.C.A. (Transportes Aeros Centro-Americanos) supports itself largely by carrying over 20 million pounds of freight a year. Paradoxically enough, South America has forty-four airline companies; the United States only eighteen. Although South American planes flew only one quarter as many air-miles as those of the United States in 1940, they covered a network two and a half times greater than ours, and transported six and a half times more cargo (in pounds) than did our lines. Yet their passenger traffic was only one-sixth as great as ours.

Mountains No Barriers

The reason for the discrepancy is to be found in the physical obstacles that confront the shipper of goods in South America. Mountains, jungles, vast swamps, river basins, and barren

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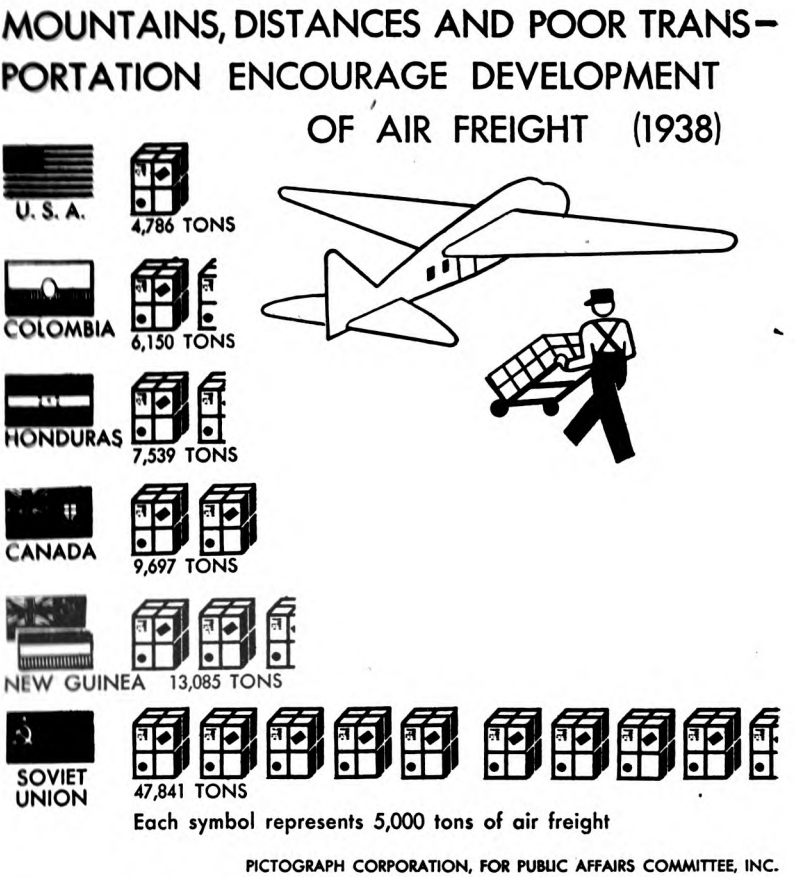
deserts have restricted surface transportation to the coast. The interior remains largely inaccessible, with the result that in thirteen out of twenty-one South American republics, air mile-



age vastly exceeds railway mileage. It takes ten days to travel by land from Rio to Asuncion, capital of Paraguay, but only six hours by air. Even over a round-about air route Rio is reached from Bogota in three days—one-seventh of the time required by land. Ground transportation costs are also higher. A journey from Rio Branco, at one end of Acre Territory in the

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northwest corner of Brazil, to Cruzeiro do Sul at the other involves a journey of four to six months by canoe and balsa raft down the Rio Purus, along the Amazon, and back up the Rio Jurua. An airplane takes only an hour and a half.

All through Latin America the plane has become indispensable. Refrigerators, radios, barbed wire, galvanized iron, tobacco, lumber, explosives, fuel, locomotives, mining machinery, cattle, donkeys, whole flocks of sheep, agricultural products, and food are carried by air to inaccessible communities. Through the service of Lloyd Aero Boliviana (L.A.B.), Bolivia is passing directly from the llama, pack horse, and mule to the plane, and this for the reason that railway and highway communication between the plateau (12,000 feet) and the lowland is virtually nonexistent. To economists, there is nothing extrordinary in this sudden transition of Latin America or of the Far East, Alaska, and northern Russia from the most primitive to the most modern method of conveyance. Many an American town leaped from the horse-drawn carriage to the trolley with never a glimpse of a horse-drawn streetcar, and many a Chinese town passed directly from candles and kerosene to electric lights.

In the highly developed countries of western Europe and in the United States, air transportation must take a different course. Of the 1,200,000,000 tons of freight carried in 1941 by Class I American railroads, 689,000,000 consisted of coal, ore, and other bulk products that could be shipped by air only at outrageous cost, and an additional 189,000,000 tons of agricultural and forest products. That more and more passengers will be carried by air we may take for granted, but it is clear that the domestic possibilities for freight lie in less-than-carload lots. Our prewar air express traffic consisted largely of articles or goods used in the process of production rather than of ordinary consumer goods — valuable machinery, hardware, printed matter, electrotypes, motion-picture films, cut flowers, jewelry, photographic goods. There is reason to believe that

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all extra-city mail and most of our passengers will be conveyed by air when great distances must be covered.

AERIAL FREIGHT TRAINS

FOR passenger and freight traffic which is to travel not more than a thousand miles, we must also reckon with towed motorless gliders. The Germans experimented with such air trains before the war, and showed that it was feasible to uncouple the last glider and guide it to the ground while the "locomotive" and the rest of the train proceeded on their nonstop way. What this means is apparent. A town of 25,000, now hardly worth an airline's attention, becomes a possible feeder of business. No longer is it utterly dependent on the railway and the steamer. Moreover, an air pick-up system, now in successful use in Pennsylvania, West Virginia, Ohio, New York, and Delaware, covers communities that range in population from 500 to 120,000. Additional applications have been filed with the Civil Aeronautics Board for the extension of the service to 1,400 communities. Apply this pick-up system to gliders, and the possibilities of what are romantically called "flying box cars" and "aerial trucks" will be immensely increased.

War Cargoes

The Germans used two types of gliders to move troops and supplies to Crete and North Africa. One type carries twenty-three fully equipped soldiers and two pilots, or a freight load of 5,300 pounds, and the other, ten soldiers and one pilot, or a freight load of 2,800 pounds. Both types are towed, like freight cars, by a three-engine Junkers plane, or a three-engine and general-purpose tug which can itself carry a load of 4,200 pounds a distance of 650 miles at a cruising speed of 146 miles an hour. Sky trains were similarly used by the Germans during 1940 in France, Holland, and Norway. On the Russian front, according to German statistics, towed and untowed planes

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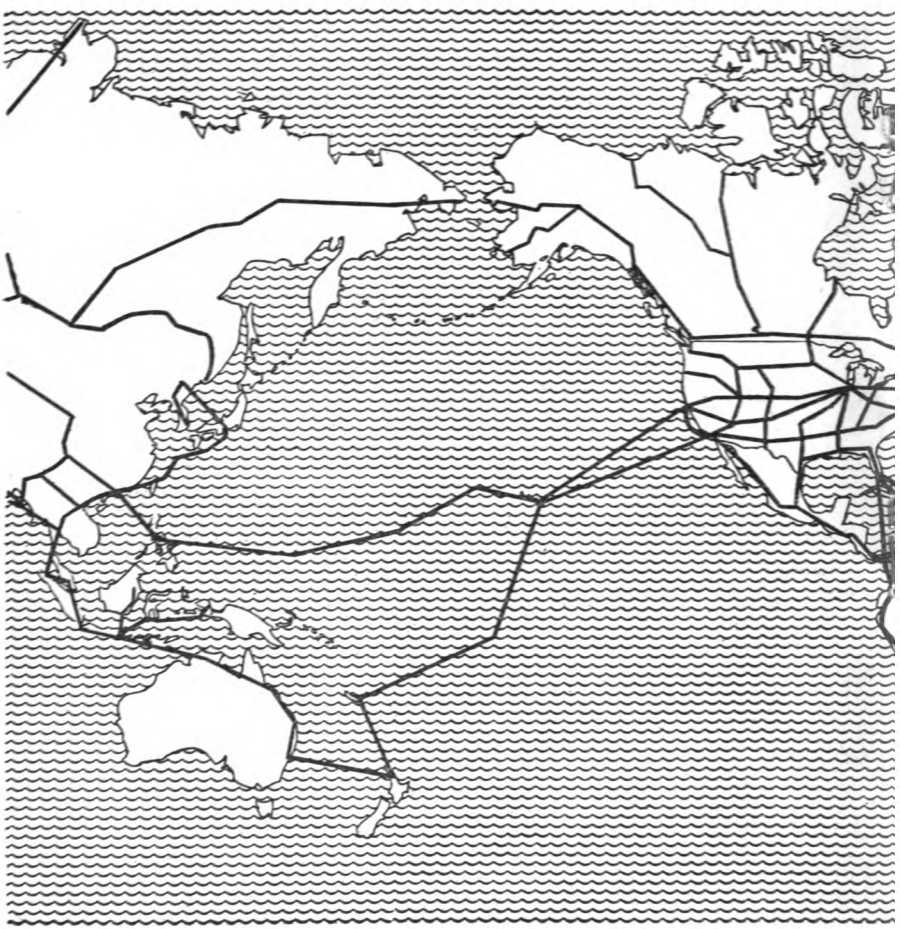
MAJOR AIRLINES BEFORE THE



The Helicopter

The helicopter, which can rise vertically from the ground and even hover over a spot, presents different problems. It will probably suit many who live in cities of metropolitan size and

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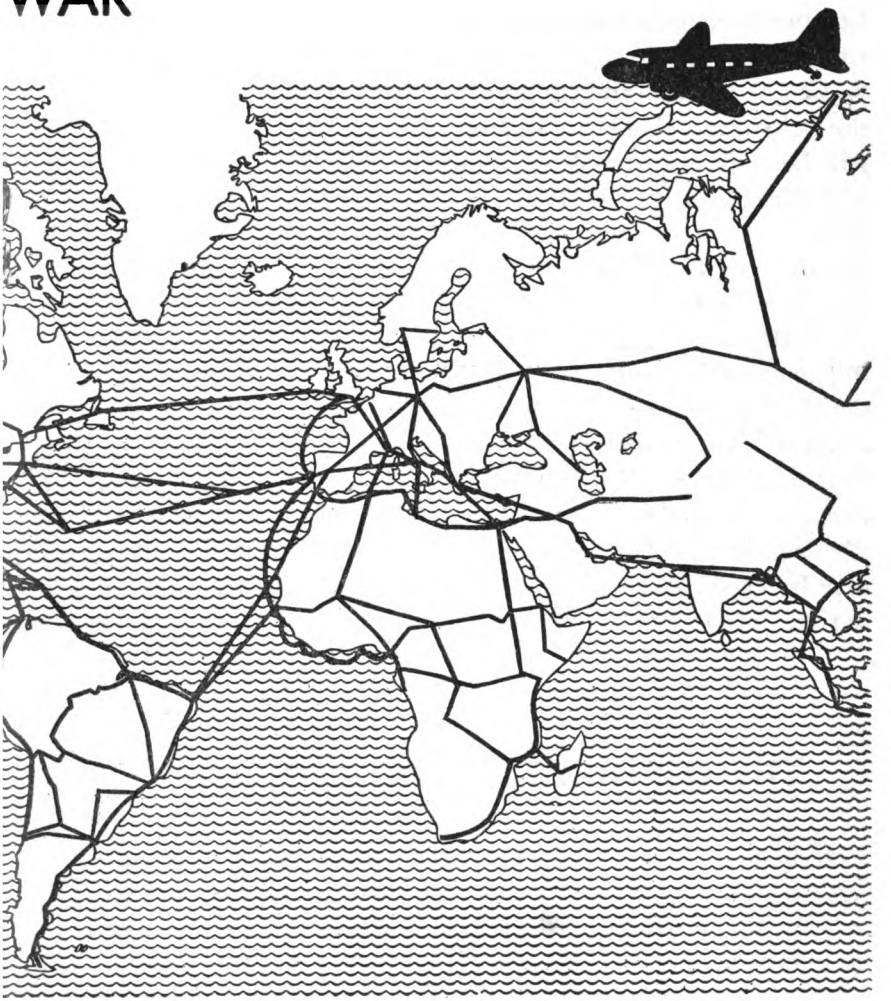
WAR



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who would rather whir up from their own backyards than travel an hour to an outlying airport. But the backyards will have to be larger than a pocket handkerchief. Probably apartment house roofs will be so designed that it will be easy to rise from their flat and ample areas. Upper stories could easily

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become hangars, with elevators to lift the helicopters to the roof. Just as whole city buildings now serve as garages, so we may expect fifteen- and twenty-story hangars in cities to receive the helicopters that whir in from the country. The architect will be required to make more of the roof than he ever did, and the authorities will be presented with the problem of devising a system of markers to guide helicopters and private planes to their destinations. Traffic will probably have to be regulated by aerial policemen to prevent collisions.

With mass-produced helicopters and family airplanes costing no more than automobiles, with trains of gliders delivering perishable goods or urgently needed express packages to thousands of small communities, the airport will take the place of the traditional public square. The commuting radius is certain to expand from the present thirty or forty miles to 150. Because of this decentralizing influence, metropolitan real estate values may be expected to decline on the average and rural values to rise.

THE OBSTACLE OF NATIONALISM

THE airplane is exercising the social and economic influence described, not as the result of a natural development of technology, but in spite of a deep nationalistic resistance to free intercourse. Whether or not we shall have more world wars, whether or not the pledges of the Atlantic Charter are to become realities, whether or not we shall evolve politically from the nation to the world federation, and eventually to the world state, depends on more factors than aerial transportation. Yet, a vehicle, which in less than a generation will carry several hundred tons of goods or several hundred passengers half around the world on a single charge of fuel, is bound to have an influence. It drives home the new importance of

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friendly international relations and demands a political outlook that goes beyond country or continent.

Government Policies

The leading powers have thus far used the airplane chiefly to strengthen their military establishments and to further aggressive economic policies and imperial unity. Great Britain built up her empire air-routes between 1926 and 1929 with no other purpose in mind. France, the Netherlands, Italy, Belgium, Japan, the United States—all saw to it that the airlines of their nationals reached out like tentacles to distant colonies, or to countries in which they were economically entrenched. Germany branched out toward the Far East, with one line ending at Kabul, another connecting Bagdad with Bangkok, and others planned to North America, South Africa, and Tokyo. Although all these lines do undoubtedly serve a commercial purpose, they were established primarily for political reasons.

Subsidies

In Europe, governments participate directly in the management of airplane companies, and this for the reason that the national interest is above that of the investor. Everywhere airplane companies have received support in the form of direct and indirect subsidies for carrying mail, and of ground facilities (beacons, airfields, meteorological service, radio beams)—support large enough to cover deficits or operating expenses. This is not necessarily an unsound policy. In most countries, railroads and ocean shipping still receive public aid. Left to itself the airplane can become a profitable conveyance in time. But there is no sign that airplane companies will be permitted to follow their own bent. What appears to be a business enterprise is usually a political convenience. This was very clearly demonstrated in the case of Germany's aerial penetration of South America.

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THE AIRPLANE AS AN INSTRUMENT OF AGGRESSION

IN the light of its political and military past, air transportation is a brilliant example of a great invention that has too often been used harmfully. A British, German, French, or American plane flies back and forth between its home port and a foreign destination, yet socially it still travels in one direction only. It brings knowledge of British, German, French, or American ways to the Far East or South America. But can it be said that it has brought back knowledge of the Far East or South America in equal measure? It is more than a coincidence that the passengers of transatlantic and transpacific clippers are usually Europeans and Americans. Of all Asiatics the Japanese alone were most frequently seen in the long-distance planes of the Orient as well as in those of the West Indies and South America. All this is what we should expect. A nationalistically-minded people aggressive enough to build and operate international airplanes is likely to use them aggressively.

The leading powers have tried to force *their* cultural ideas, *their* goods upon backward peoples. Both the radio and the film have also been used in this way. Before the war the airplane was added to the list of persuasive weapons. The Italian network of airlines in Albania, established before the military conquest of 1939, was a factor in reducing that country to the status of a colony. Belgium and France used the airplane to strengthen their hold on countries to which they were economically and culturally linked. A railroad is probably the most effective means of thus dominating a foreign country. But if airplanes travel often enough between the great European centers and countries that are worth exploiting, much the same effect is achieved. Subsidized airlines have been used to heighten the prestige of France and Germany in South America, and they have served to strengthen the sentimental ties that bind Latin American republics to European mother

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countries. Couple this use of the airplane with an intense nationalism and it is not difficult to understand why huge settlements of Germans and Italians in South America should cling passionately to their cultures and to their mother countries. Radio, the film, and air transportation are the most powerful instruments ever devised to unify the world. Yet all have been deliberately used by governments to breed disunity.

Not the Only Sinner

It seems almost to be a social law that the more direct and effective the means of tranportation and communication the more likely is it to be misused. International telegraphs, cables, telephones—all passed under governmental supervision and control in Europe not only because they were public utilities but because of their potentialities in breaking down differences in national points of view. So far from rejoicing in Hollywood's motion pictures, however they may appeal to the masses, every European government restricts their importation and exhibition. Before the outbreak of hostilities in 1939, German, Russian, Polish, French, and Italian radio stations "jammed" one another if their outpourings seemed to conflict with national policy.

The international airplane repeats this gloomy history, this resistance to world unity. Its world-wide introduction has been marked by clashes—diplomatic clashes, economic clashes, ideological clashes. A means of intercourse which mocks such natural barriers as oceans, mountains, deserts, and vast stretches of territory and which ought to have been used sensibly from the beginning to break down racial, religious, and political differences to achieve world peace and unity, has been deliberately exploited as a weapon of domination. World power is now air power. So true is this that it has loomed large in every disarmament conference held since the last war and in the plans of those who would establish a new and permanently peaceful world order.

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Headaches for the Future

There are no signs at present that possible aggressors of the future will be aerially disarmed. Both in the halls of Congress and of Parliament, speeches have been made which clearly indicate a desire to use the long-distance airplane to secure economic and political advantages over distant countries. Both Great Britain and the United States, especially the United States, will emerge from the war with immense fleets and production facilities. The United States is acquiring far more experience in flying over vast stretches of water than Great Britain; for American bombers are not only ferried across the Atlantic but piloted to North Africa and far-distant Pacific islands. To argue that the United States has always been pacifically inclined and that it has never abused its strength is to ignore its fortunate economic position. The United States and Russia are about the only fairly self-contained countries in the world. They can afford to be pacific. Nations without coal or iron, cotton or oil, and the other essentials of production have a legitimate claim on both markets and resources—claims which are expressly recognized in the Atlantic Charter.

Even the most idealistic country can hardly be expected to decide questions which are essentially international in character with perfect justice. It must not be forgotten that in his historical writings Woodrow Wilson had no word of commendation for our Mexican War, an act of aggression that added a huge territory to the United States; or that President Theodore Roosevelt once remarked, "I took Panama and let Congress wrangle about it afterwards." The international problems raised by the increasing range and speed of the airplane call for an impartial international solution. That solution will not be easy. Nationalism is growing, not waning. It is growing in the countries crushed and occupied by Germany—countries that will be satisfied with nothing less than their old political status and independence. And it is growing in China, Arabia, North Africa. Even Soviet Russia has abandoned the Trotsky formula of world-revolution and has become nationalistic.

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A world in which the air is dominated by the western democracies on the one hand and by Russia on the other, with an awakened China still to be heard from, may be a safer world than that which was created by the Treaty of Versailles. But it will not necessarily be a world in which there will be no economic, political, and military clashes. The more the relation of air power to permanent peace is studied the more it becomes obvious that air traffic must be placed under a single international authority and that peace must be preserved with the aid of an international air force. Major de Seversky has made the point that a comparatively small fleet of long-range bombers would be enough to curb aggressors. Probably ten or fifteen bomber stations strategically located around the Arctic Circle and other regions would be enough.

WHO OWNS THE AIR?

THE architects of the new world order are all agreed that there must be some yielding of sovereign rights, some willingness to accept the decrees of a central administration if another devastating war is to be avoided. That yielding becomes all the more necessary if the international airplane is to bring people together who are as far apart culturally, politically, and racially, as Chinese and Germans, Ethiopians and Swedes, Arabs and Belgians.

The sovereign right that most urgently needs modification so far as the airplane is concerned is the one expressed in the doctrine that a nation owns not only its soil to the center of the earth but the air to an infinite height above.

Politics and Air Travel

Before the days of air transportation, sovereignty in the air was of no great importance. For this reason it was not formally recognized until the International Convention for Air Navigation of 1919. Since this convention was held, there has been

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a growing insistence on sovereign rights to the air. International aviation has therefore been the subject of much diplomatic jockeying. Beaten in the last war, Germany was never permitted to send its commercial airplanes to North America and for some years was kept out of France. When France was at the height of its power and particularly friendly to Poland and Yugoslavia, its airplane monopoly, *Air France,* received important concessions from both countries. After Poland and Germany seemed in a fair way of arriving at an understanding and France was no longer highly regarded in the Balkans or in Russia, *Air France* lost ground in eastern Europe. When Soviet Russia began to court its neighbors, Czechoslovakia and Bulgaria, airlines were established between Prague and Moscow and between Sofia and Odessa. Both Hitler and Mussolini obtained valuable air concessions from Spain's Franco and saw to it that the airlines of France, the Netherlands, and Great Britain were excluded from Spain. Air travel between Germany and the Soviet Union shifted more or less from good to bad and from bad to good with the political relations between the two countries. Transatlantic flying became possible only after much negotiating between the United States on the one hand and France, Portugal, and Great Britain on the other. Great Britain insisted at first on obtaining the same rights from us, but had to yield when the United States obtained a concession from France. Because of all this diplomatic parleying, transatlantic commercial flying was a political impossibility for some years.

Restrictions on Air Travel

The airplane has never enjoyed what is called "the right of innocent passage," meaning the right of passing through foreign territorial waters. A vessel may steam freely through the English Channel or through the Straits of Gibraltar or similar waterways within the absolute control of a country, and it may put into any port without asking for special permission. Yet almost from the beginning, rights over the air have been

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more strictly enforced than over territorial waters. All the flyers who flew around the world, for example, were compelled to ask the help of their governments in obtaining rights of passage from every nation that they intended to cross. International travel by air has been possible only by special arrangement. Concessions are demanded of which a shipping company knows nothing. When, for example, American plane operators tried to include the Caribbean Sea in their network they encountered strong opposition from the British and French. Operating rights in Ireland and Newfoundland could be obtained by Pan American Airways only by offering Imperial Airways similar rights in the United States. The dirigibles, *Graf Zeppelin* and *Hindenburg,* were permitted to land here on the theory that their voyages were experimental, and even then licenses were ordinarily granted only for a stated number of voyages.

When regular landings on foreign soil are necessary, a hard bargain is usually driven. In the countries of the Near and Middle East over which planes must fly from western Europe to the Far East, stops must be made for no commercial reason. Permission to land is granted only if the national interest is furthered, whether or not the service is of international importance. Sometimes the number of planes that may land is limited, and sometimes business and income must be shared with some local airline and a number of unnecessary jobs created for the local citizenry. Because of political resistance, the great European airlines may not cross Turkey, with the result that their craft must fly either along the Persian coast, as the Dutch and French do in normal times, or along the Arabian coast, which is the British practice.

The development of the stratosphere plane will probably reduce the present restrictions on free passage through the air to absurdity, but the danger of sudden invasion will remain. When a hundred and more tons of freight or 200 passengers and their luggage are carried at 45,000 or more feet—a height where detection is hardly possible—it is not likely that air-

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liners will pay much attention to sovereign rights that cannot be enforced when no landing is necessary. If distress landings are punished by fines, world opinion will protest effectively. It is even conceivable that a country by-passed with some social and economic loss to itself will actually implore a foreign airline to make use of its land. On the other hand the stratosphere plane with a range of half the earth's circumference could easily be used by a strong, predatory nation in making many simultaneous surprise attacks.

AVIATION AND THE NEW WORLD ORDER

IT is hard to believe that the stubborn insistence on sovereign rights in the air will stand forever in the way of the most rapid and direct mode of travel ever devised. The basic idea of nationalism must change. There is no chance for a buffer state. A few centuries ago a small state like Venice or the Netherlands could become a sea power of major importance. Air power can be built only by a rich, industrially advanced nation. Because it has made even widely separated nations next-door neighbors, its management can no longer be left to a dozen monopolies, each the creature of some government with economic and military designs that affect the destiny of whole regions. If the Atlantic Charter means what it says, backward countries should have some voice in giving international flying a new and more useful social purpose and direction. We dare not forever use the airplane as a means of exploitation. Yet so long as transcontinental and transoceanic planes can easily be converted into bombers, so long as nations arm themselves to the teeth in preparation for war, transit through the air will be limited and we can expect nothing more than an intensification of the struggle for mastery of undeveloped regions.

Since military policy accounts for most of the existing restrictions, and cultural and economic aggression for the rest, it was apparent long before the outbreak of this World War

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that the airplane cannot reach its full usefulness without disarmament. Hence it has been proposed that both military and commercial aviation be put under international control and that a world air force be maintained by the League of Nations or some other central body to insure peace. France, Belgium, Czechoslovakia, Switzerland, Turkey, Poland, the Scandinavian countries, Turkey, and Yugoslavia were in favor of the proposal when it was placed before the Disarmament Conference of 1932 by France. When it came up for consideration at the meeting of the Air Transport Cooperation Committee of the League in that same year it was opposed by American, British, Dutch, German, Italian, Swedish, and Swiss members.

Need for International Control

It was the French who most urgently championed internationalization at the Disarmament Conference of 1932. Though they clearly recognized the relation of aviation to war and to a peaceful world order, they still left room for international monopolies. In their plan the world was to be carved into regions, each to be controlled both technically and economically by an International Air Transport Union. The number and the geographical scope of the lines within its region were to be determined by each Union. Deficits were to be made good by the members of a regional Union. Pilots and operating ground crews were to be selected fairly with an eye to national claims. And the same principle was to apply to orders for new planes and the improvement of ground facilities. Compulsory arbitration, hearings in which the guilt or innocence of aggressors was to be determined, means for carrying out decisions, about every issue that could arise were provided for. In a word, the French saw clearly that the internationalization of aviation is part and parcel of any proposal for disarmament and the preservation of international peace and order.

The structure of the International Air Transport Unions is probably too compex. There is little need of them for the

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simple reason that the airlines of the leading industrial powers cover whole continents and oceans. Not the region but the world is the smallest unit that must be considered now that we are to have planes which will range over 15,000 miles, if Major de Seversky is right. The whole concept of sovereignty, especially sovereignty in the air, must change. It must be recognized that though frontiers have been drawn to keep nationals apart it is the business of the airplane to bring nations together. Airplanes must be as free as ships. National military, political, and economic policies must not be permitted to restrict that freedom.

It is probable that if aviation is permitted to develop freely along sound lines it will be unnecessary for governments to make good the operating losses. If this proves to be impossible, some provision must be made for the maintenance of air lines that serve a useful social purpose. An administrative structure and policy much like that provided by our Civil Aeronautics Act will probably simplify the solution of the financial and other economic problems that are bound to rise. Self-support should be encouraged. But it is more important to obtain a consolidation of the world's leading air powers and impose upon them an obligation to develop backward regions.

Secrecy Should Be Eliminated

Lastly there remains the technical development of the airplane. Up to now there has been competition not only in the establishment of airlines but in the improvement of planes. Every country has shrouded its air advances in secrecy. This has never been the way of science. Discoveries have always been exchanged freely by chemists, physicists, mathematicians, and biologists. Any restriction has been regarded as a cultural loss. So it should be with aeronautics. Reform of the present policy of secrecy may require a revision of patent laws, but they should be scrutinized and amended in any event if economic strife and war are to be avoided. In the United States airplane patents are already pooled and freely exchanged. This

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enables the entire aircraft building and operating industry to benefit by the smallest technological advance. There is no reason why the same practice should not be spread throughout the entire world. A world administrative body might decide to do away with patents entirely and to grant funds for research to be conducted by carefully selected, suitable laboratories for the benefit of the world. Unless some such plan is adopted, governments and semigovernmental companies will continue to conduct research more or less in secret, with the result that a nation which has given only half-hearted consent to a world program of air transport will gain an advantage over the others.

No proposal for the abolition of war can ignore the airplane, and no proposal for the internationalization of commercial aviation can succeed unless there is all-round and not merely partial disarmament. With new aerial giants in the offing, giants that bring India closer to the United States than Boston was to Washington in stage-coach days, the planet transcends any single country in importance. Is world unity to be achieved by some ruthless, militaristic power and maintained by all the resources of transportation and communication much as the British and Dutch empires were held together? Or by some new League of Nations with power to enforce its decisions, or by some federation of states? This is the issue. It is an issue much older than the airplane, but it is an issue which can no longer be evaded. Isolation and the airplane cannot go together.

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