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WHAT CAN THE BUREAU OF AIR COMMERCE TELL YOU ABOUT AIRPORTS*

A. B. McMULLEN†

What the Bureau of Air Commerce could tell you about airports would require more time than can be allotted any single speaker at this important meeting. Therefore, my remarks shall be confined to what I believe to be of current interest to the persons present.

The Bureau of Air Commerce is continuously engaged in research and in the coordinating of studies, ideas, suggestions, and information received from all branches of the aviation industry. Therefore, what the bureau can tell you about airports evolves directly from organizations such as your own and the industry as a whole.

The most important airport problems requiring immediate attention involve planning, financing and legislation. Each individual airport development includes all three and from three different viewpoints: namely, Federal, State, and local.

A few years ago, the pilot of an airplane was in supreme command of his plane. He had complete authority in choosing his method of take-off, flight plan, approach and landing. The safety of the airplane, his passengers and the cargo he carried, depended entirely upon the skill and ability of the pilot. Today, we have an entirely different picture; trained meteorologists to keep the pilots and operators alike constantly advised as to the weather conditions over the routes they intend to fly; trained traffic personnel to regulate landing, take-off, and the flight of airplanes along prescribed routes; licensed radio operators who, by means of two-way radio, are able to keep in constant touch with airplanes on the ground and in the air. These agencies and others of a similar nature, utilized to direct and aid aerial traffic are usually located upon the airport which has become the nerve center of aviation.

Upon the airport are concentrated the specialized facilities for the storage of all types, sizes, and classes of airplanes; repair facilities involving complicated machines for X-ray testing, photograph-

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ing, repairing and servicing of the airplanes and their power plants. The personnel and machinery used to maintain airplanes, engines and instruments must be specialized in the extreme, and proper housing must be provided for these activities.

Concentrated, too, at the airport must be buildings for the comfort and convenience of aerial travelers, rest rooms, waiting rooms, first aid facilities, ticket offices, loading and unloading ramps, and in some cases, hotel accommodations. Where the airport is a port of entry, provision must also be made for immigration, health and customs inspections.

With all these facilities for increasing the safety of flight, for controlling it, for keeping the airplanes in the air, and providing for the easy and convenient movements of passengers, we have yet to include the main purpose of an airport; that is, the place where the airplane must come to rest and resume its flight. This area used for landings and take-offs requires the most expert planning in layout and design if costly mistakes are to be avoided. With the increased weight of aircraft, higher landing speeds, and the use of brakes, hard surfaced runways and taxi-ways must be constructed to withstand the abrasive effect of much heavy traffic. They must also be of sufficient width and length to provide a safe operating area under all conditions. They must also be laid out so as to take advantage of varying wind directions and velocities.

The airport being the foundation of aviation, planning should precede construction, and construction precede operating requirements by months at least, if the progress of aviation is not to be restricted by lack of airport facilities. The example of our existing airports clearly shows how little planning has sometimes actually been done. In the case I refer to, the airport is located in level country; few obstructions surround it. Only one building of any size has been constructed, yet the first runway to be built ran directly into the hangar, which was the only obstruction of any size on or in the vicinity of the airport. The original runway has now been abandoned and a new one is being constructed in such a manner that the hangar is not a hazard. The expense involved as the result of poor planning is obvious.

As far back as 1932, the Bureau attempted to forestall the selection of airport sites that would not permit future expansions. Aeronautics Bulletin No. 2, entitled "Airport Design and Construction," issued July 1, 1932, stated "the Department recommends that regardless of the size of the city concerned, an area meeting at least the minimum requirements for a (1) rating should be controlled

from the start of the airport project in order to provide for future expansion and in many cases this controlled area should be considerably larger." Had this recommendation been observed, much expensive remodeling and relocation of airports would have been unnecessary, as well as the acquisition of additional land, often by costly condemnation proceedings.

As an example of costly land acquisition, let us review the case of Portland, Oregon. While dredging a shipping channel in the Willamett River several years ago, the City of Portland created an island and on it built one of the finest, most modern airports of its time. For the equipment operating at the time of construction, its size was adequate and its location close to the center of town was ideal, but with the arrival of the Boeing 247 and similar types of planes, it began to be apparent that operations under some conditions were hazardous. When still larger planes were placed in service, there was nothing to be done but choose another site, where an airport large enough to meet present requirements could be constructed. Swan Island Airport, one of the first air terminals, will soon pass out of existence as a base for scheduled operations to be superseded by an airport one mile square, at a cost of \$300,000 for land alone.

Another airport only recently improved clearly illustrates this point. Surrounded on three sides by a river which prevents expansion, this airport may never be suitable for scheduled feeder-line operations, even with the development of a high performance transport, because of runway lengths limited to 2,000 and 2,250 feet. The amount of money spent during the last three years would have gone a long way toward construction of an airport that could have been enlarged at a later date had the proper site been selected originally. This site is also subject to flooding and may not be usable when the city most needs air transportation.

Many scheduled airline terminals and many airports not utilized by scheduled airlines are operated day and night, 12 months a year, 24 hours a day. A complete lighting system must be provided, by means of which the pilot can be sure that his approach is unobstructed, and which will clearly designate given areas or runways upon which he may safely land. This lighting system is more complicated and often much more expensive than that usually found in the average town of 5,000 people. Auxiliary power systems must be provided, so that in the event of failure of the usual source of supply from any cause whatsoever, the lights on the field can continue to function.

At the modern airport provision must be made for heating plants, the elimination of snow, proper drainage, parking space for automobiles, the control of hundreds of spectators, first aid facilities, fire fighting equipment and many facilities with which the average citizen is unfamiliar.

These are the problems that enter into the development of the individual airport. Primarily they are the responsibility of the local officials or agencies legally charged with airport development. Only by the most intensive study and by means of close contact and cooperation with the various Federal, State, and commercial organizations interested in aviation can these local officials hope to keep abreast of this rapidly changing industry. When you stop to consider what all this means, and when you realize that on an airport, you have the concentrated results of all the study and all the research, all the mistakes, and all the successes of the aviation industry, you may then begin to understand a few of the problems that confront the designing airport engineer and manager.

These problems would be simpler if the aviation industry had become stabilized as have the industries engaged in supplying other means of transportation.

The individual airport by itself is of little value to aviation. A complete and coordinated system of airports and airways is needed to make the airplane a practical means of transportation. Development in one state is limited in value unless all States construct a system of suitable airports. Therefore, the airport problem immediately becomes national in scope.

All plans for the development of civil airports should be closely coordinated with plans for national defense.

Formulation of a national airport program considering the requirements of the various States and communities and the needs of the scheduled airlines, private flyers, and other phases of the aviation industry is the responsibility of the Bureau of Air Commerce. Recognizing this responsibility, the Bureau of Air Commerce is continually striving, by study, research, and experimentation to determine present and possible future requirements of the individual airports which constitute the national system.

This research by the Airport Section has led to the development of an electrically synchronized and automatic recording camera by means of which the landing and take-off characteristics of all types of airplanes can be accurately determined. The importance of such a machine is obvious when you consider it enables

us to determine for any type airplane the distance and time required to unstick, rate of climb, rate of acceleration, distance traveled to attain any given altitude immediately after take-off, at airports of varying altitudes and atmospheric conditions. This in turn enables us to determine the size and length of runways and landing strips necessary for the safe operation of various types of aircraft.

Anticipating the extensive development of transoceanic flying and the necessity for proper seaplane terminals to accommodate this service, the Airport Section has recently conducted a survey to determine performance characteristics of the various types of transoceanic seaplanes and the water areas that will be required for present and future aircraft of this type. It was found that what was formerly considered to be a safe operating area was actually the minimum distance required to get the seaplane into the air with no consideration given to the distance required to obtain a safe operating altitude. Considering the distance required by large seaplanes to take off, and their inability to maneuver on the water and at low altitudes, plans are being formulated which we believe will result in the establishment of seaplane operating areas or channels, properly marked and policed, which can be restricted to the use of seaplanes exclusively.

Supplementing the information already at hand, we have prepared a questionnaire which is designed to show the airport facilities that now exist, the cost of developing and maintaining those facilities, and the cost of the land upon which the airport is located. These questionnaires will be completed for every airport in the United States. The following is a duplicate of page three of this questionnaire which is used to obtain the amount of Federal, State, and local funds that have been spent on airports, airport facilities and improvements. The figures included represent the totals for 361 airports on which questionnaires have been filled in and received.

The tables immediately following show the total income and expenditures during the year 1936 for these same 361 airports and the sources from which the income was received and for what the money was expended.

DUPLICATE OF PAGE 3 OF FINANCIAL QUESTIONNAIRE SHOWING TOTAL AMOUNT OF FUNDS EXPENDED ON 361 AIRPORTS, FOR WHICH COMPLETED QUESTIONNAIRES HAD BEEN RECEIVED ON NOVEMBER 18, 1937

Items	Federal Funds*	State Funds	All Other Funds	Total	%
a. Land: No. of acres 47018. Original cost or value if donated..	\$ 372,000	\$ 9,096,578	\$ 9,468,569	25.8	
Estimated present value of land, \$12,782,568					
b. Clearing & Grading	5,998,630	157,377	4,107,298	10,253,305	28.0
c. Drainage System ..	1,037,435	36,486	1,047,693	2,121,614	5.8
d. Fencing, Roads, Walks, Auto Parking Areas & Landscaping	303,233	25,285	437,339	765,857	2.1
e. Seeding, Sprigging, Sodding, Topsoiling (Landing Area) ...	733,046	14,364	439,574	1,186,984	3.2
f. Hardsurfacing—Runways, Taxiways & Aprons	2,805,112	252,457	1,713,037	4,770,606	12.9
g Hangars No.	639,986	58,748	2,718,989	3,417,723	9.4
h. Equipment—Shop, Field, Fueling & Fire-fighting	33,917	45,819	335,534	415,270	1.1
i. Administration Building	194,994	40,000	874,373	1,109,367	3.0
j. Other Buildings No.	30,727		664,720	695,447	2.0
k. Field Lighting Equipment	163,488	64,130	569,426	797,044	2.2
i. Radio Equipment...	9,516	2,417	85,058	96,991	.2
m. Miscellaneous	935,133	9,877	638,074	1,583,084	4.3
Total	\$12,885,217	\$1,078,960	\$22,718,898	\$36,691,870	
Per Cent	34.9	2.9	62.2		100.0

* Federal Funds include all "Federal" expenditures made by the various Work Relief Administrations for improvements to this field. Sponsor's contributions are included in "State" or "Other Funds."

DUPLICATE OF PAGE 4 OF FINANCIAL QUESTIONNAIRE, SHOWING TOTAL AMOUNT OF INCOME ON 361 AIRPORTS FOR WHICH COMPLETED QUESTIONNAIRES HAD BEEN RECEIVED ON NOVEMBER 18, 1937.

7. *Income*, for the year ending December 31, 1936.

In order for all returns to be comparable, please use the following definitions of items to be included in the subheads below.

- a. Revenue derived from airline operators. Indicate how these charges are set:
- b. All revenues derived from hangar storage facilities only; including the rental paid by those who have leased site and constructed their own hangars;
- c. All revenue derived from building space rentals, except hangars; including site rentals paid by those who have leased sites and constructed their own buildings;
- d. Revenue derived from sale of power, water, and heat, including landing light fees;
- e. Revenue derived from dining room, newsstand, recreational facilities and all other sources of revenue of a non-aeronautical character other than rent;
- f. Profit derived from sale of gasoline and oil;
- g. Revenue from sale of spare parts and aircraft, schools, passenger flights, service, and other activities of a strictly aeronautical character;
- h. All revenue not classifiable under any other heading.

	<i>Scheduled Air Transport</i>		<i>All Other Operations</i>		<i>Total</i>	<i>%</i>
(a) Landing Fees	\$11,105	14.3	\$1,150	.3	\$12,255	2.6
(b) Hangar Storage	28,743	36.8	73,723	19.6	102,466	22.4
(c) Rents	12,670	16.3	26,697	7.0	39,367	8.6
(d) Light, Heat, Water & Power	1,067	1.3	7,409	1.9	8,476	1.9
(e) Concessions	2,610	3.3	14,257	3.8	16,867	3.8
(f) Aviation Gas-Oil	17,829	22.8	71,904	18.9	89,733	19.7
(g) Commissions .....	.....	...	118,824	31.1	118,824	25.9
(h) Other	4,000	5.2	63,311	16.8	67,311	14.7
Miscellaneous .....	.....	...	2,144	.6	2,144	.4
Totals	\$78,024	100.0	\$379,419	100.0	\$457,443	100.0
Per Cent	17	83	100	100	100	100

DUPLICATE OF PAGE 5 OF FINANCIAL QUESTIONNAIRE, SHOWING TOTAL AMOUNT OF MAINTENANCE AND OPERATIONS EXPENSES ON 361 AIRPORTS FOR WHICH COMPLETED QUESTIONNAIRES HAD BEEN RECEIVED ON NOVEMBER 18, 1937.

- 8. *Maintenance and Operation Expenditures.* Under this heading we wish to arrive at the total operating and maintenance cost of your airport for the year ending, December 31, 1936.

<i>Item</i>	<i>%</i>	<i>Amount</i>	<i>%</i>
a. Salaries (Administrative)	32.7	\$ 249,578	18.7
b. Rent (If field is leased)	3.3	25,515	1.9
c. Light, Power, Water & Heat	8.5	64,986	4.8
d. Field area (excluding runways Maintenance Only)	6.7	51,092	3.9

<i>Item</i>	<i>%</i>	<i>Amount</i>	<i>%</i>
e. Runways and Taxiways (excluding runways Maintenance Only)	7.2	54,144	4.0
f. Parking areas, roads, walks, fences, etc. (excluding runways Maintenance Only)....	1.2	8,670	.6
g. Drainage .....	.2	1,178	.1
h. Hangars	3.1	23,607	1.8
i. Buildings, shops, etc.	3.6	27,687	2.0
j. Field Lighting	3.4	26,193	1.9
k. Miscellaneous	13.7	104,994	7.9
l. Taxes	5.6	42,638	3.2
m. Insurance	2.2	16,675	1.2
Other	8.6	65,808	4.9
Sub Total	100.0	\$ 762,767	56.9
n. Amortization of Bond, etc.		426,321	32.1
o. Interest		145,231	11.0
Total		\$1,334,319	100.0

In bringing this survey to your attention, I should like to mention that to be of any real value it should be completed within the next few weeks. With the limited personnel of the Airport Section, and considering the other duties they are called upon to perform, it will be impossible for us to obtain this information without considerable assistance from local and State authorities, and the active cooperation of all State aviation officials is earnestly solicited.

With this information and the airplane and seaplane performance data previously mentioned it will, we believe, be possible to accurately determine what additional airports and facilities are needed to complete a system of airports that will accommodate the present requirements of aviation and the expansion we may reasonably anticipate in the immediate future.

As to finances, the previously mentioned questionnaire will also give us a basis for better estimating the cost of additional airports and improvements necessary to complete a satisfactory system throughout the United States. Many individuals and organizations are now recommending that a long term program of airport and airway development be inaugurated with the Federal Government, the States, and the local communities sharing jointly a just and equitable proportion of the cost.

In order that you may understand how far it is necessary to travel before any such arrangement becomes a reality, let me remind you that the Federal Government is not at the present time

making annual appropriations sufficient to maintain the small Airport Section of the Bureau of Air Commerce, which would be a name only were it not for emergency funds made available by the Works Progress Administration.

Much legislation must also be passed by all three governmental units mentioned above, before such a working arrangement would be possible. Briefly, this entails local legislation permitting counties and cities to singly or jointly own, operate, and maintain airports with authority to construct and maintain these ports, if they so desire, in conjunction with their respective States and the Federal Government.

State legislation of a similar nature is also necessary in many States. Satisfactory airport zoning laws or ordinances are absolutely necessary in all States and communities that have not already passed them. Federal legislation is also necessary before a Federal appropriation can be made for airport purposes.

The Air Commerce Act should be revised and brought up to date. This Act now prohibits the Department of Commerce from spending money on airports and from installing certain air navigational aids on air terminals.

Many of you have asked how soon the new Civil Air Regulations governing the rating of airports would be placed into effect and what the requirements for the different ratings will be. A year of constant study has been given these proposed regulations and they have already been drafted and redrafted several times. As soon as they have been approved by the reviewing board of the Bureau of Air Commerce, they will be submitted to you for suggestions and criticism before final adoption. It is my hope that they will be in your hands before the first of next month.

The National Association of State Aviation Officials represents practically every State in the Union, your membership represents not only a cross section of aviation, but business and the professions as well. Your organization has continuously worked unselfishly for the advancement of aviation. The Bureau of Air Commerce, cognizant of these facts, is depending upon your advice and assistance in carrying forward such programs as the Bureau has inaugurated for the development of aviation. As an ex-member of your organization, my advice to you is: continue the friendly attitude and the open minded policy you have always adopted toward all aviation interests; continue the type of leadership you have always demonstrated and the accomplishments of your organization will fill many chapters in the history of American aviation.