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UNITED STATES METHODS OF EVALUATING AIR ROUTES IN BILATERAL AIR AGREEMENTS*

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THEORY

The theory of air route evaluation is simple. It is to assign a monetary value to each unit of traffic (a passenger or a weight unit of cargo) carried or to be carried between the points constituting the route by the carriers presently or prospectively in operation. The total monetary value is about the same as gross revenues obtained or to be obtained by the carrier or carriers from the implementation of the route rights authorized. The value is related to a period of time, usually a year, which may be a current one or a projection thereof to a future year; in the case of a new route, generally the expected first year of operation.

Monetary values are used because these take into account not only the number of units of traffic carried but also the distances they are carried and thus provide the weighting effect which establishes an equality in value to the carrier between 10 passengers carried 100 miles and 1 passenger carried 1,000 miles. This weighting effect would be provided by applying the mileages to the units of traffic resulting in numbers of passenger-miles (convertible to passenger ton-miles) and cargo ton-miles but these figures are not as widely recognizable as dollar values. Furthermore, if an abbreviated procedure is desirable or necessary, it is possible to obtain dollar values by multiplying the units of traffic by estimated average fares, in the case of passengers, or by average charges per weight unit for cargo and thus avoid the need to determine and apply distance factors.

In the case of domestic routes, the purpose is accomplished by:

1. Determining the volume of traffic that moved or can be expected to move over the route during the period of time for which the

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estimate of value is being made (*Note*: For a new route, this volume of traffic is the historic volume increased by the applica- tion of an appropriate stimulation factor reflecting the degree of increased quality of service that will be provided by the new route in comparison with the service existing prior to the im- plementation of the new route);

2. Assigning the proper share of the traffic to the carrier or carriers authorized *or to be authorized to operate over the route; and*

3. Putting an appropriate monetary value on each carrier's share of the traffic.

In assigning carriers' shares of the total traffic on a domestic route it is assumed that there will be participation in the traffic movement in proportion to carrier authorization, i.e., carriers with the same measure of authority will have equal participation in the traffic. However, domestic route issues are insulated from considerations that each nation is sovereign over its airspace. This sovereignty significantly affects the evaluation of international air routes. International air routes frequently extend through several States, transporting goods and people of other States as well. They may be considered as multilateral in structure and use. However, they are exchanged on a bilateral basis.

The origins and the type of air transport agreements advocated by the United States are well known. However, since the principles of those agreements are the core of the route evaluating techniques being discussed, some brief mention is appropriate.

When the States at the Chicago Conference were unable to agree on the multilateral exchange of traffic rights except those of transit and landing for servicing or other technical reasons, the stage was set for the bilateral exchange of traffic rights. Subsequently, practically all traffic rights for scheduled services were provided for bilaterally. Today more than a thousand bilateral air transport agreements are registered with ICAO.

The principles the United States follows in the exchange of traffic rights stem from the air agreement it reached with the United Kingdom in 1946. The agreement established capacity principles that achieved a balance that permitted carriers freedom but guarded against excesses. The principles have four standards. The first one pertains to the oppor- tunity of carriers to operate on the routes to which they have been designated. This is that it shall be "fair" and that it shall be "equal."

The second pertains to the relationship between carriers competing

in trunk services. This is that "the interests of the air carriers of the other government shall be taken into consideration so as not to affect unduly the services which the latter provides on all or part of the same routes."

The third pertains to the relationship between the combined capacity of the operators and the total traffic. This is that it "should bear a close relationship to the requirements of the public for such transport."

The fourth pertains to the comparative roles of primary traffic and secondary or Fifth Freedom traffic. This in substance states the primary objective of a designated air carrier to be the provision of capacity adequate to the traffic demands between the carrier's own country and the ultimate destination of the traffic, and that the right to third country traffic shall be applied in accordance with general principles of orderly development, and subject to the general principle that capacity should be related to traffic requirements between countries of origin and ultimate destination of the traffic, requirements of through airline operation, and traffic requirements along the route after taking account of local and regional services.

The types of traffic referred to as primary are commonly referred to as Third and Fourth Freedom. Secondary traffic is Fifth and Sixth, although some States do not recognize the Sixth. More precisely defined they are: -

Freedom III — The right of an airline of one country to set down in another country traffic coming from the country of the airline's nationality.

Freedom IV — The right of an airline of one country to pick up in another country traffic destined for the country of the airline's nationality.

Freedom V — The right of an airline to carry traffic from a point of origin in one foreign country to a point of destination in another foreign country.

Freedom VI — "6th Freedom" is a term applied to that type of Fifth Freedom traffic carried from a point of origin in one foreign country to a point of destination in another foreign country via the country of nationality of the airline.

The freedom classification of the traffic makes it possible to deter-mine the entitlement of each carrier to participate in the movement

of traffic between each pair of points on the international route over which it operates. A carrier has a greater entitlement to carry that traffic which is its primary justification traffic, i.e., either Third or Fourth Freedom, than to carry secondary justification or Fifth and Sixth Freedom traffic.

Freedom classification is determined on the basis of the true origination and ultimate destination of the traffic. Ideally, information as to the origination, destination and details of the routing, including stopover and connecting points and identification of carriers participating in the journey should be obtained from the ticket or combination of tickets on which the journey is made. However, at the present time, the availability to the United States of information as detailed as this is limited to that in the CAB Origin-Destination Survey of Passenger Traffic and a similar survey conducted by the Canadian Government plus special arrangements for traffic data exchanges with a small number of other foreign countries. There are encouraging signs that more detailed data concerning the movement of international traffic will be available in the future.

In the meantime, it is necessary to make use of whatever complete data are available and supplement this with other available data to make the best possible estimates of the volumes of primary and secondary justification traffic, as related to each carrier, moving or estimated to move over the routes or between the pairs of points under consideration. There is enough information to apply the method of route evaluation based on freedom classification.

METHODOLOGY

General

International air route evaluations, either of benefits actually obtained from existing routes or forecast estimates of potential for proposed routes, are approached in relation to the bilateral arrangement under which the routes are exchanged. This means that estimates are sought of the gross revenues accruing to the carriers of the United States and of the foreign country from the operations of the air carriers of each country in exercising the route rights exchanged or to be exchanged between the two countries. These gross revenues are not the same as those secured from the operations on the route but only those revenues obtained by virtue of the agreement. Specifically, these revenues are those obtained by U.S. carriers from the carriage of traffic enplaned and deplaned by them in the foreign country based on the distance of the continuous

movement into or out of that country. Similarly, revenues are estimated for the carriers of the foreign country from the movement of traffic into and out of the United States which the carriers of the foreign country enplane and deplane there.

Values are assigned only to that traffic enplaned and deplaned in one country by the carriers of the other country since values are not considered attributable to direct transit traffic, i.e., that which arrives and departs on the same aircraft on those flights serving the point in the country for which values are being computed as an intermediate point.

Freedom Entitlement Method

The Freedom Entitlement Method is presented here as the ideal or model method which is used to the maximum extent feasible when valuing route exchanges between the United States and foreign countries which involve routes of more complexity than the simple transborder type with no intermediate points and no "beyond rights."

The procedure is used both to estimate the value of new routes and, with appropriate modifications, to determine the benefits obtained from operations over existing routes. These modifications comprise principally the substitution of actual or estimated or assumed traffic volumes. The steps involved in evaluating a new route can be stated briefly as follows:

1. Determine the volume of traffic having true originations in the United States and ultimate destinations in the foreign country and *vice versa* for the time period selected. This volume will include the movement by all carriers and combinations of carriers and will therefore include not only that traffic which moved directly between the countries but also that which made stopovers en route or used indirect and connecting routings. This total volume is the basic or historic primary justification, i.e., Third and Fourth Freedom, traffic moving between the countries.

2. Project the basic traffic volume to a future year such as the expected first year of operation of the new route by applying to the basic volume an appropriate annual growth factor derived from analysis of the traffic growth trend in the area covered by the proposed route.

3. Increase the projected basic primary traffic volume to reflect the increased quality of service to be provided by operations over

the new route by applying a stimulation factor based on time and mileage savings, new single-plane service, etc. that would be made possible by the new route compared with service available during the base year. (This increased traffic volume becomes what is referred to below as the available basic annual primary justification traffic.)

4. Adjust the available basic annual primary justification traffic volume to determine the portion thereof that can be expected to move directly (nonstop) between the countries on the carriers of the United States and the foreign country by subtracting the volume expected to travel by third country carriers, connecting routings or to make stopovers at intermediate points.

5. Assign the adjusted nonstop primary traffic volume equally to the carriers of the United States and the foreign country.

6. Determine the volume of additional primary justification traffic expected to be carried into and out of each country by carriers of the other country to and from any intermediate points that may be provided for in route exchange. This is traffic having its true origination/destination in the homeland of the carrier on which it is traveling but has stopped-over at an intermediate point.

7. Determine the amount of primary justification traffic available to the carriers of each country on operations beyond the other country if such operations are included in the route exchange. This is traffic having true origination or ultimate destination in the homeland of the carrier but which has stopped-over in the other country.

8. For each estimated amount of primary justification traffic carried into and out of each country by carriers of the other country add an appropriate volume of secondary justification traffic which is traffic having neither its initial origination nor ultimate destination in the homeland of the carrier on which it moves.

9. Multiply the estimated units of traffic assigned to the carriers of each country by the number of miles of continuous movement into or out of the other country to obtain the number of passenger-miles and cargo ton-miles.

10. Apply yield figures to the numbers of passenger-miles and cargo ton-miles to obtain monetary values of the movement of the

traffic on the carriers of each country. These yield figures usually stated as "cents per passenger-mile" and "cents per cargo ton-mile" are, in most cases, averages calculated from traffic and financial reports of U. S. carrier operations in the same general geographic area as the route being evaluated.

Appraisal of Freedom Entitlement Method

Consideration of a simplified hypothetical route exchange might serve to clarify the statement of the methodology. This exchange could be assumed to be between country A and country C with each country granting full intermediate traffic rights to the other at country B. Also, country A is to have rights beyond C to countries D and E while C has rights beyond A to country X. The assumed route exchange could be depicted diagrammatically as follows:
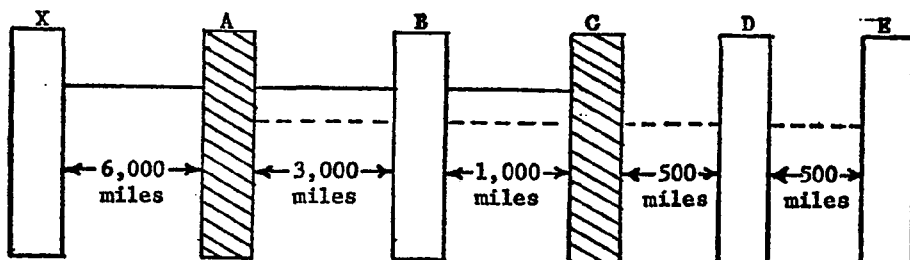
Route rights granted by:

Country A to Country C ————
Country C to Country A - - - - - - -

(Nonstop rights are assumed but not shown.)

From the distances shown in the diagram country A could be taken as the United States and country C would be a European country located beyond a major country B. Country X would then represent a major country in Asia. Countries D or E could be in Eastern Europe. It should be noted that with respect to the freedom composition of the traffic on board an international air carrier there will be variations in this composition on flight stages into and out of its homeland depending on the relative importance of that homeland in terms of "terminal" or "intermediate" market characteristics. Thus, the freedom composition of the traffic on U. S. carriers over flight stages contiguous to the United States can be expected to consist almost entirely of primary justification traffic

because this country is predominantly a "terminal" market for international air traffic.

In addition to the grants of explicit route rights shown in the diagram there are also implicit rights, by reason of beyond homeland operations, for carriers of country C to carry traffic between country A and countries D and E. Similarly, carriers of country A can participate in traffic between X and C. This traffic is secondary justification traffic (Fifth Freedom) for the carriers of country C in the first instance cited and country A in the second. From the U.S. view of freedom classification this traffic falls in a subdivision of Fifth Freedom called Sixth Freedom. In a limited number of cases, the United States has conceded that this type traffic enplaned and deplaned by a foreign carrier in the United States can be added to the primary justification traffic of the carrier if it makes a *bona fide* stopover in the homeland of the carrier. This concession, however, does not recognize a change in the freedom classification of the traffic by reason of the stopover.

Referring again to the diagram of the hypothetical route exchange it can be noted that because of the United States' (country A's) high traffic-generating capacity it exchanges large volumes of passenger traffic with most foreign countries, some of which stops over at intermediate countries. When carried by U.S. carriers this traffic not only provides support for their operations between the United States and the country of stopover but also the U. S. carrier operations beyond the country of stopover when the journeys are resumed. Thus in the example, traffic between country A and countries D and E stopping over in country C supports country A's level of operations between country C and countries D and E. Similarly, traffic between country C and country X stopping over in country A can be used to support country C's operations beyond country A to X.

The step by step construction and results of this hypothetical route exchange are set forth in Appendix A to this study.

The "Freedom Entitlement Method" just described has not been used in certain cases because of data shortcomings which are being corrected. When necessary the principal alternative methods of route evaluation are the "Exploitation or Penetration Method" and the "Access Method."

The Exploitation Method involves ascertaining or estimating the current or future annual volume of traffic flowing over the route, i.e., between the points constituting the route and assuming a plan of opera-

tion over the route by the carriers authorized or to be authorized to operate. If all route points are not specified, assumptions are made as to the points that will be served. After making assumptions as to the aircraft capacity, frequency of flights, and load factors, estimates are made of the participation in the estimated traffic of the carriers of the two countries exchanging the routes plus any third country carriers that have the right to provide service over all or any portion of the routes and then computing values by applying yields or average fares or charges to the estimated traffic volumes. Essentially, the procedure is to forecast the proposed operation and estimate the extent to which each carrier can be expected to exploit the right available to it or to penetrate the estimated market potential. A variation of this method is to:

(1)   Estimate the volume of primary justification traffic for the year selected moving between the United States and the country with which routes are being exchanged;

(2)   Assume an equal participation in this traffic by the carriers of the two countries;

(3)   In the case of the foreign country, assume a pattern of operation for its carriers that is related to its volume of primary justification traffic;

(4)   Determine the foreign carrier's total volume of traffic estimated to be carried to and from the United States by:

(a)   assuming the foreign carrier will carry a volume of secondary justification traffic equal to the volume of its primary justification and noting the resulting load factor, or

(b)   assuming a certain load factor and noting the volume of secondary justification traffic that would be required to attain the assumed load factor; and

(5)   Assign a monetary value to the total volume of traffic carried by applying appropriate mileage and yield figures or applying average estimated realized fares or charges per unit of traffic.

The Access Method follows:

(1)   Estimate the total volume of traffic expected to move directly between the point or points in the United States and point or points in the foreign country under consideration during the chosen time period, which is usually one year;

(2)   Assume a certain percentage of the estimated traffic (usually 10%) will move on third country carriers and the remainder will be

shared as stated in (3) below by the carriers of the United States and
the foreign country with which the route exchange is being considered;

(3) Determine the shares of the traffic moving directly between
the countries on the basis of the extent to which the carriers of the two
countries have access to the traffic at the point of its initial movement
(*Note*: The carrier having access to the traffic at the point of its initial
movement obviously has an advantage over the carrier that does not have
such access and should have a value assigned to it reflecting this advan-
tage. It does not follow necessarily, however, that this value should be
the full value of the carriage of the traffic);

(4) Determine the traffic assignable to the carriers of the two
countries on international route segments that are part of the exchange
but are:

(a) intermediate to the two countries;

(b) beyond the United States in the case of the foreign carrier;

or (c) beyond the foreign country in the case of the U.S. carriers.

In these cases the carriers of the United States and the foreign country
are assumed to participate in the total estimated traffic volumes moving
over these segments as third country carriers, thus sharing with the
other third country carriers in the 10% or whatever percentage of the
total is assumed to be available for these carriers; and

(5) Assign monetary values to the total estimated traffic carried
by the carriers of each country into and out of the other country using
the procedures stated for the other methods.

The foregoing description of the "Access Method" is a simplified
one. It makes it appear that the method does not take into account the
freedom classification of the traffic carried by the carriers of one country
into and out of the other country, although this is not necessarily so.
A variation of the stated method could have the carriers of the two
countries assumed to share equally in the primary justification traffic
moving between the two countries and then adding an appropriate amount
of secondary justification traffic so that the total freedom composition of
a carrier's traffic might, for example, be 60% primary and 40% secon-
dary.

CONCLUSIONS

International air routes for scheduled services are, in practically
all cases, exchanged between nations bilaterally. This creates the re-

quirement for nations to determine their principles for the exchange
of traffic rights.

The United States principles for the exchange of traffic rights were
established in 1946. They remain in effect and have been reaffirmed
consistently by the United States Government. These principles are
reflected in the evaluation methods used to assess the value of air routes.

The three principal methods used for evaluation of routes are the
Freedom Entitlement, Exploitation and Access. The preferable method is
the Freedom Entitlement.

In most cases there is sufficient data to evaluate routes with a
fairly high degree of precision. However, further improvements in data
are desirable. There are encouraging signs that more detailed data con-
cerning the movement of international traffic will become available.

APPENDIX

*Evaluation of Proposed Route Exchange Using Hypothetical
Traffic Volumes*

If country A, i.e., the United States, was considering the proposed
route exchange with country C, it would be necessary for it to have
available a computation of the revenues that would be obtained by its
carriers from operations using the rights to be obtained from country
C and also the revenues expected to be obtained by carriers of country
C in using the rights granted to country C by country A. These com-
putations would be required to permit a comparison of the value of the
rights to be received by country A balanced against those granted by
it to country C.

In making these computations the best available data would be
used for the traffic volumes, historical or projected, that are involved in
the proposed route exchange. In the example set forth below arbitrary
choices have been made of the numbers of passengers and the relative
volumes of primary and secondary justification traffic enplaned and
deplaned by a carrier of one country in the other country.

The example using hypothetical values is as follows:

ENPLANED/DEPLANED ANNUALY IN COUNTRY *C* BY CARRIERS OF COUNTRY *A:*

No. of passengers	Flt. stage	True orig. -ult. dest.	Classification
On flight stages between A and C:			
1,000	A - C	X - C	Secondary
100,000	A - C	A - C	Primary
20,000	B - C	A - C	Primary
5,000	B - C	B - C	Secondary
20,000	A - C	A - D	Primary
10,000	A - C	A - E	Primary
2,000	B - C	B - D	Secondary
1,000	B - C	B - E	Secondary
600	A - C	X - D	Secondary
400	A - C	X - E	Secondary

Summary by flight stage and classification:

130,000	A - C		Primary
2,000	A - C		Secondary
20,000	B - C		Primary
8,000	B - C		Secondary

Summary by classification:

150,000		Primary (93.8%)
10,000		Secondary (6.2%)
160,000		

On flight stages beyond C:

15,000	C - D	A - D	Primary
5,000	C - D	A - E	Primary
2,500	C - E	A - E	Primary
1,000	C - D	B - D	Secondary
500	C - E	B - E	Secondary
100	C - D	X - D	Secondary
50	C - E	X - E	Secondary
18,900	C - D	C - D	Secondary
1,950	C - E	C - E	Secondary

Summary by flight stage and classification:

20,000	C - D	Primary
20,000	C - D	Seeondary
2,500	C - E	Primary
2,500	C - E	Secondary

Summary by classification:

22,500	Primary
22,500	Secondary

ENPLANED/DEPLANED ANNUALLY IN COUNTRY *A*

BY CARRIERS OF COUNTRY *C:*

On flight stages between A and C:

No. of passengers	Flt. stage	True orig. -ult. dest.	Classification
100,000	A - C	A - C	Primary
30,000	A - C	A - D	Secondary
15,000	A - C	A - E	Secondary
7,000	A - B	A - C	Primary
7,000	A - B	A - B	Secondary
500	A - C	X - C	Primary
300	A - C	X - D	Secondary
200	A - C	X - E	Secondary

Summary by flight stage and classification:

100,500	A - C	Primary
45,500	A - C	Secondary
7,000	A - B	Primary
7,000	A - B	Secondary

Summary by classification:

107,500	Primary (67.2%)
52,500	Secondary (32.8%)
160,000	

On flight stage beyond A:

No. of passengers	Flt. stage	True orig. -ult. dest.	Classification
500	A - X	X - C	Primary
300	A - X	X - D	Secondary
200	A - X	X - E	Secondary
2,000	A - X	A - X	Secondary

Summary by flight stage and classification:

500	A - X	Primary	(16.7%)
2,500	A - X	Secondary	(83.3%)
3,000			

Translating the foregoing traffic figures into estimates of passenger revenues by applying mileage and yield factors results in the following estimates of benefits to be obtained by the two countries from the operations of their carriers:

Country and operation	No. psgrs. and classi-fication*	Flt. stage	Mileage	Passenger-miles (000's)	Passenger revenues ($000's) (@5c/p.m.)
Country A					
Between					
A and C	130,000P	A - C	4,000	520,000	$26,000
	2,000S	A - C	4,000	8,000	400
	20,000P	B - C	1,000	20,000	1,000
	8,000S	B - C	1,000	8,000	400
Subtotal	150,000P			540,000	27,000
	10,000S			16,000	800
Total	160,000			556,000	$27,800
Beyond C	20,000P	C - D	500	10,000	500
	20,000S	C - D	500	10,000	500
	2,500P	C - E	1,000	2,500	125
	2,500S	C - E	1,000	2,500	125
Subtotal	22,500P			12,500	625
	22,500S			12,500	625
Total	45,000			25,000	1,250
Grand Total	205,000			581,000	$29,050

Country C

Between					
A and C	100,500P	A - C	4,000	402,000	$20,100
	45,500S	A - C	4,000	182,000	9,100
	7,000P	A - B	3,000	21,000	1,050
	7,000S	A - B	3,000	21,000	1,050
Subtotal	107,500P			423,000	21,150
	52,500S			203,000	10,150
Total	160,000			626,000	31,300
Beyond A	500P	A - X	6,000	3,000	150
	2,500S	A - X	6,000	15,000	750
Total	3,000			18,000	900
Grand Total	163,000			644,000	$32,200

* (P=primary;
   S=secondary)

DISCUSSION OF RESULTS OF EXAMPLE

The resulting total values are $29,050,000 for country A and $32,200,000 for country C. Examination of the exemplified data set out above points up several interesting aspects of the evaluation of a route exchange between the United States (country A in the example) and a country located beyond the first gateway outside the United States with a long flight stage between the United States and that gateway. Even assuming an equal participation by the carriers of the two country-parties to the route exchange in the Third and Fourth Freedom traffic moving directly between them (100,000 passengers each in the example) and with an equal number of passengers enplaned and deplaned in each country by the carrier of the other country on the operations between the two countries (160,000 passengers), country C shows an advantage in benefits from these operations by about $3,500,000 ($31,300,000 less $27,800,000). In looking at the traffic volume assumptions it might seem that the volume of intermediate Fifth Freedom traffic for country A is unreasonably small (5,000 passengers O & D between B and C). The value of the carriage of these passengers over the 1,000 mile flight stage is estimated at $250,000. If there were five times as many passengers in this group, however, it would only add $1,000,000 to country A's benefits, or reduce the advantage to country C to $2,500,000. The amounts

of Fifth and Sixth Freedom traffic that have been assumed for carriers of country C are clearly not excessive since 67.2% of the passengers enplaned and deplaned in country A on operations between A and C are in the primary justification category. It is likely that actual operations would result in a smaller percentage of primary traffic for country C than is shown here.

With respect to operations beyond each of the countries by carriers of the other country, it is seen that because of country A's traffic-generating capacity it has a much more viable operation beyond country C than is the case of C's operation beyond A. The primary justification traffic carried by A's carriers on the flight stages C - D and C - E are, of course, stopover passengers in country C having originations/destinations in country A.