

AN ANALYSIS OF AIR PASSENGER GROWTH
CONSTRAINED BY FUEL ALLOCATIONS

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Discussion Paper

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CONCLUSIONS

- o Current CAB, FAA & AAC forecasts of air passenger traffic will be constrained by fuel shortages through 1985.
- o Assuming implementation of currently publicized fuel conservation measures, the air system could satisfy about 18% more domestic demand and about 14% more international demand in 1974 than in 1973 with 85% of the 1972 total fuel consumption.
- o A fuel allocation policy which limits air carriers to 75% of the 1972 total fuel consumption will limit the revenue passenger-mile growth to 4% domestically and to only 1% in international service in 1974.
- o Beyond 1974, a fuel allocation of 75% of the '72 total consumption constrains the 1975 domestic service to 2% growth over the 1974 passenger-miles. The international service will experience essentially no growth in 1975. Between 1975 and 1985 a 75% allocation constrains growth to about 1% per year for both domestic and international service.

PURPOSE

This analysis was performed to estimate the impact of the current aviation fuel shortages on projected air passenger traffic and to provide a basis for assessment of the resultant impact on the airport and urban system interface.

Current forecasts of revenue passenger miles (RPM) and enplaned passengers by the CAB, FAA and the Federal Aviation Advisory Commission have not taken into account the constraining influence of the current fuel shortage or potential federal fuel allocation policies.

Although it is not imperative to our current Air Systems Studies (PPA OS444) to have a sophisticated forecast, it is none-the-less necessary to determine the range of traffic volumes which the system will probably experience and to assess the impact of the high and low levels on the subsystems currently under study. Whether passenger enplanements at our large hub airports will triple by 1985 or be constrained to a 20 percent increase over current levels leads to significantly different conclusions relative to an action plan for federal involvement in the physical development of the airport and urban systems interface.

APPROACH

The approach taken in this analysis was to estimate the potential maximum capability of the U.S. fleet to service the demand, given certain allocations of fuel and feasible efficiency improvements.¹ CAB Operating performance data by service, by equipment type, by carrier for 1972 were used to develop productivity measures in passenger-mile per gallon of fuel. The fleet mix and fleet productivity were analysed and projected to 1985. The maximum fleet capability was estimated for each time period by application

1 Estimates of fuel savings possible by numerous operating procedure options available to airlines, CAB, and FAA are contained in TSC Reports No. DP-SA-4 "A discussion of the Impact of the Middle East Oil Embargo on U.S. Air Transportation" and PM-SA-9 "A Proposed E&D Program for Energy Conservation on Air Transportation".

of the projected fleet productivity to some percentage of the 1972 fuel consumption. Thus a series of ceilings or upper limits of total system RPM for several possible fuel allocation policies can be compared against estimates of unconstrained demand. The detailed assumptions, data sources and computation methodology are noted on the graphs and ledger sheets.

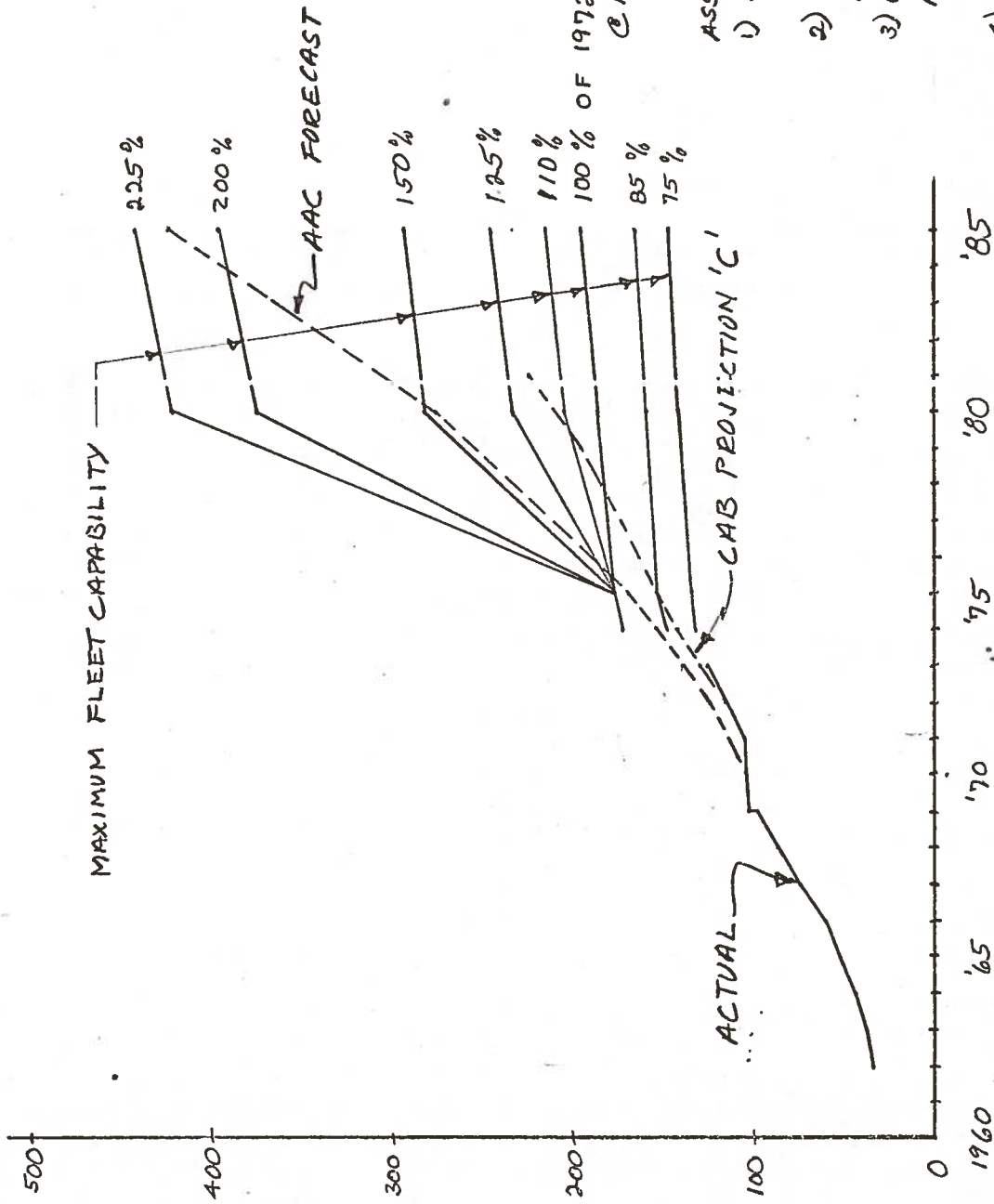
No attempt was made to analyze individual airlines route structures or markets for potential flight reductions. It was felt that, for this analysis, equipment operating data as reported to the CAB adequately reflects route structure, frequency of service and variability of demand on a system basis. Fleet capability projections were based on CAB fleet mix projections to 1975, feasible increased seating, and 65% average load factor for each equipment group. Projections beyond 1975 were based on moderation of the recent rate of increase in productivity (RPM/Gal) and the various fuel allocations.

U.S. DOMESTIC TRUNK + LOCAL SERVICE CARRIERS

FUEL CONSTRAINED REVENUE PASSENGER - MILE GROWTH

REVENUE PASSENGER-MILES

BILLIONS



100% OF 1972 SYSTEM FUEL CONSUMPTION @ MAXIMUM RPM/GAL.

ASSUMPTIONS:

- 1) 33% INCREASE IN AVERAGE PAX PER AIRPLANE MILE
- 2) CONTINUED INCREASE IN AVERAGE FLEET PRODUCTIVITY (RPM/GAL.)
- 3) CURRENT ROUTE STRUCTURE MAINTAINED & ALL EXIST. MARKETS SERVED
- 4) COMBINATION CARRIERS TERMINATE DOM. FREIGHTER SERVICE & UTILIZE 65%-75% OF WIDE-BODY & 4 TFNB LOWER HOLD CAPACITY

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U.S. DOMESTIC TRUNK & LOCAL SERVICE
 FUEL CONSTRAINED RPM GROWTH

D-4

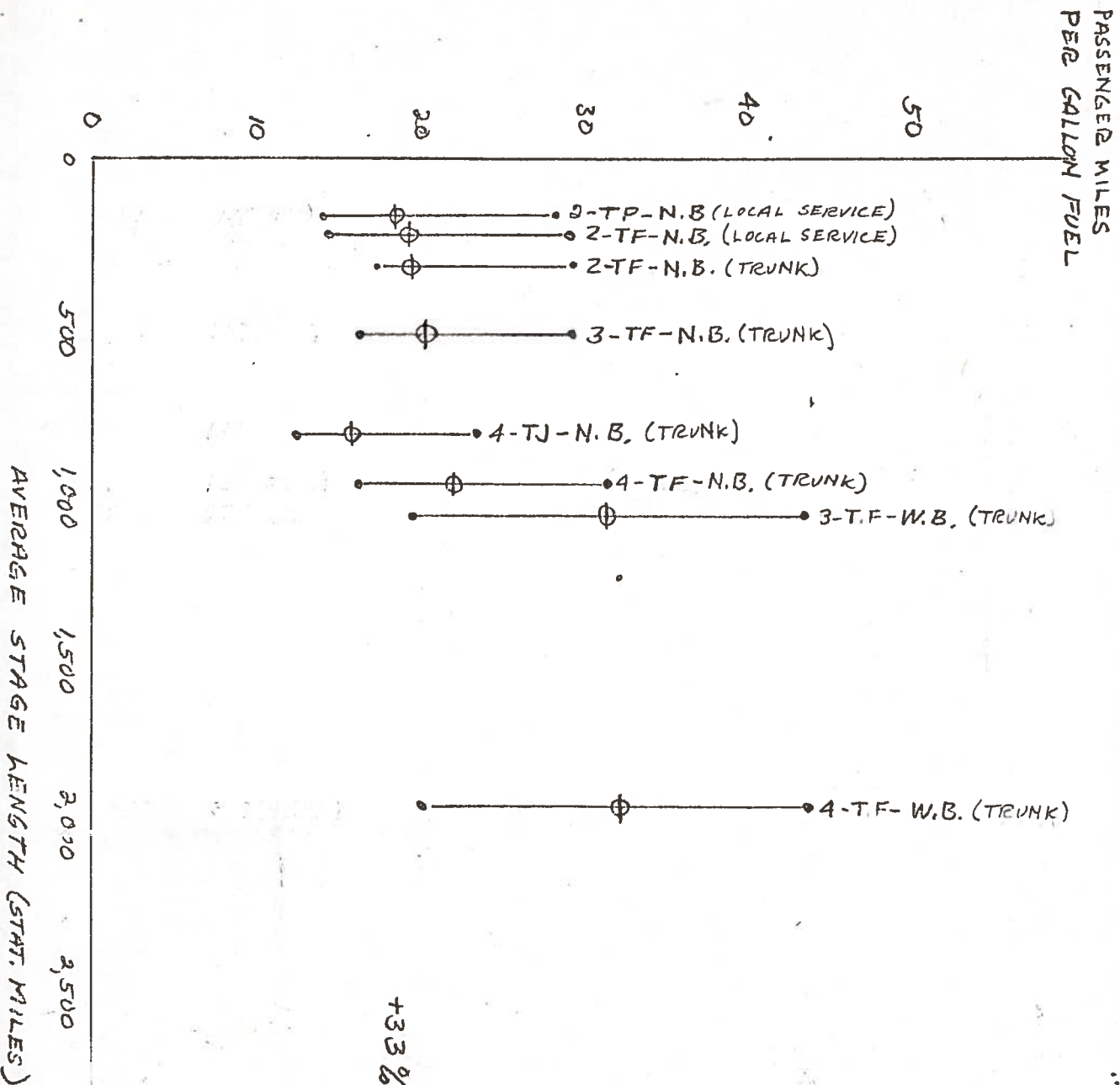
ACTUALS

MAXIMUM FLEET CAPABILITY

TOTAL FUEL ALLOCATION AS % OF 1972 CONSUMPTION	'72	'73	'74	'75	'80	'85
MAX FUEL CONSUMPTION			98% 7,293,241			
MAX RPM	21.4		23.2	23.7	158	24.9
105%	—	—	1,311,126	1,331,152	1,403,225	1,413,517
110%	—	—	1,422,110	1,461,312	1,539,149	1,557,125
115%	—	—	—	—	—	—
120%	—	—	—	—	—	—
125%	—	—	—	—	—	—
130%	—	—	—	—	—	—
135%	—	—	—	—	—	—
140%	—	—	—	—	—	—
145%	—	—	—	—	—	—
150%	—	—	—	—	—	—
155%	—	—	—	—	—	—
160%	—	—	—	—	—	—
165%	—	—	—	—	—	—
170%	—	—	—	—	—	—
175%	—	—	—	—	—	—
180%	—	—	—	—	—	—
185%	—	—	—	—	—	—
190%	—	—	—	—	—	—
195%	—	—	—	—	—	—
200%	—	—	—	—	—	—
225%	—	—	—	—	—	—
250%	—	—	—	—	—	—
275%	—	—	—	—	—	—
300%	—	—	—	—	—	—
325%	—	—	—	—	—	—
350%	—	—	—	—	—	—
375%	—	—	—	—	—	—
400%	—	—	—	—	—	—
425%	—	—	—	—	—	—
450%	—	—	—	—	—	—
475%	—	—	—	—	—	—
500%	—	—	—	—	—	—
525%	—	—	—	—	—	—
550%	—	—	—	—	—	—
575%	—	—	—	—	—	—
600%	—	—	—	—	—	—
625%	—	—	—	—	—	—
650%	—	—	—	—	—	—
675%	—	—	—	—	—	—
700%	—	—	—	—	—	—
725%	—	—	—	—	—	—
750%	—	—	—	—	—	—
775%	—	—	—	—	—	—
800%	—	—	—	—	—	—
825%	—	—	—	—	—	—
850%	—	—	—	—	—	—
875%	—	—	—	—	—	—
900%	—	—	—	—	—	—
925%	—	—	—	—	—	—
950%	—	—	—	—	—	—
975%	—	—	—	—	—	—
1000%	—	—	—	—	—	—
AAC Forecast	1,359,640	1,370,333	1,534,485	1,639,331	2,742,241	2,742,241
* CAB Forecast	1,119,081	1,129,069	1,261,546	1,332,232	(79)1,173,000	(80)1,200,000
4% Inflation (Actual Rate)		1,299,647	1,351,639	1,403,504	1,511,030	1,563,421

* Includes Freight Service by Commercial Carriers
 * CABs Report 1972-85 of Inflation on Domestic Service

AIRPLANE FUEL PRODUCTIVITY - 1972 FLEET U.S. DOMESTIC TRUNK AND LOCAL SERVICE CARRIERS



SYSTEM AVERAGE

ASM/GAL.

Estimated Practical Maximum
@ MAX SEATING DENSITY & 65% L.F.
RPM/GAL

+33%

TF - TURBO FAN
 TJ - TURBO JET
 TP - TURBO PROP
 WB - WIDE BODY
 NB - NARROW BODY
 ASM - AVAILABLE SEAT-MILES
 RPM - REVENUE PASSENGER-MILES
 L.F. - SEAT LOAD FACTOR

DIAGNOSTIC TROUBLE LOGS SERVICE WHICH: PARTS WERE CHANGED - 1/1/72

1972 AVERAGES

EQUIPMENT GROUP No. of Eng. Type	AGE YRS	AGE IN SERVICE	AVAIL. SEATS PER AIR-MILE FACTOR	SEAT LOAD %	TOTAL E.P.M. (1st)	TOTAL FUEL (100 GAL)	RPM/GAL	RECON FIGURED FOR MAX. SEATING & LOAD FACTORS INCREASED TO 65%
4 - TF - 112	T	50	217	47.8	11,916	582	20.1	358
3 - TF - 112B	T	37	224	45.4	5016	25433	19.7	249
4 - TF - 112	T	29	133	51.3	28672	17901	16.2	143
4 - TF - 112	T	122	116	51.9	8806	22173	12.0	122
2 - TF - 112	T	586	107	55.1	38862	24008	12.2	114
2 - TF - 112	T	310	86	51.3	15059	8671	17.4	88
2 - TF - 112	T	164	90	49.3	6662	4645	14.3	91
2 - TF - 112	T	207	48	47.3	2236	1693	14.0	48
TOTAL E.P.M. SEATING FACTOR					117,029	7,252	16.14	438.6
TOTAL E.P.M. FLEET					6,580	837	12.7	155,240
TOTAL N.C. FLEET w/872412					563,753	24,921	31.93	143,698

* Fuel consumption increase per flight caused by increased passenger luggage loads is assumed.

Sources: Col. 1-5, CAB Aircraft Operating Cost Factors: Report Part I.

Col. 7 Weight's average seats per aircraft-mile assumption: 60 seats per aircraft-mile.

Col. 5 Computed as follows: (Total Airline Hours) x (1/2) Block Hours to Airline Hours (1/2) Fuel per Block Hour

Col. 4 Computed as follows: (Total Airline Hours) x (Average Airline Speed) x (Average Revenue Assigned per aircraft-mile)

be compensated by FAA imposed fuel surcharge procedure.

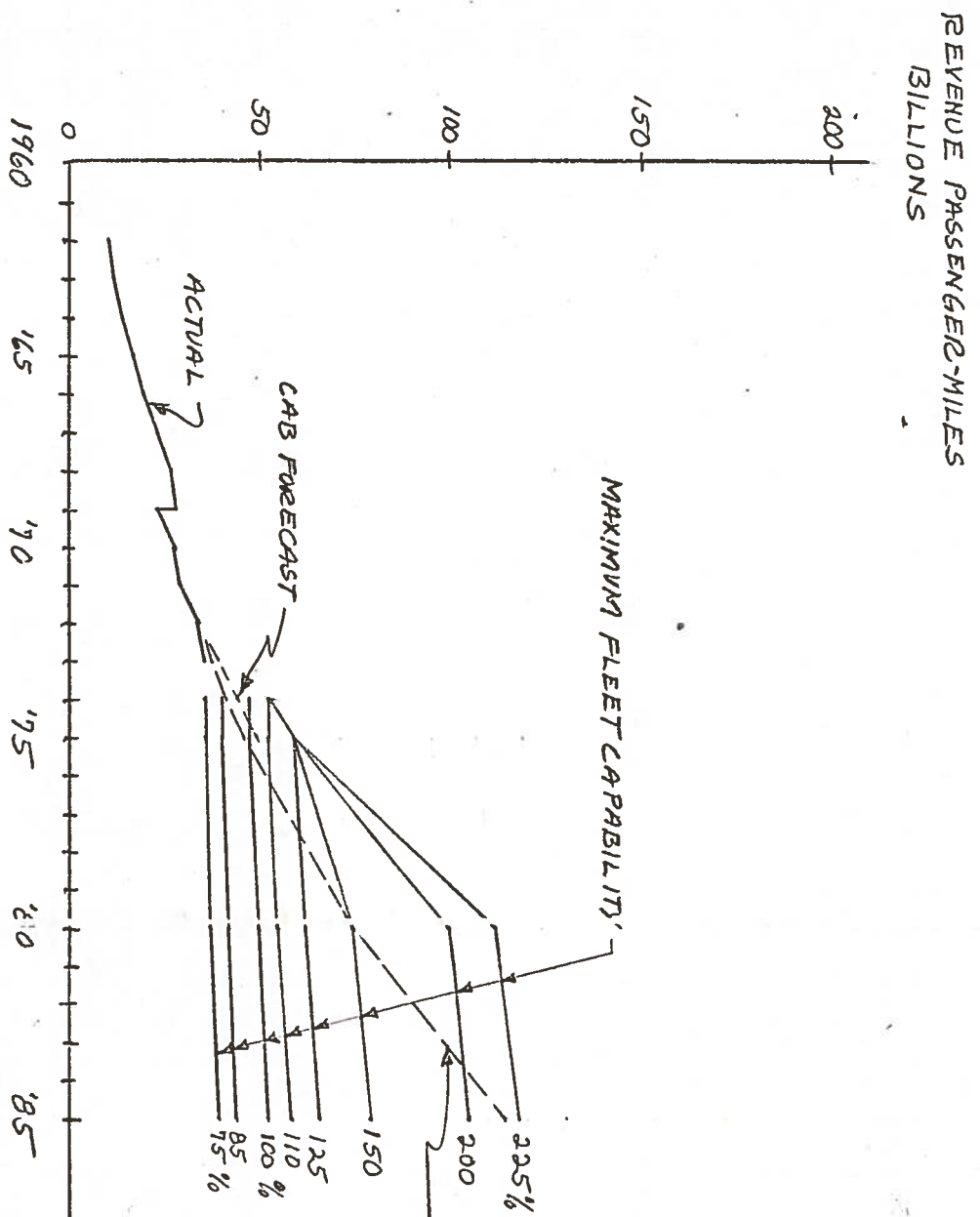
RECON FIGURED FOR MAX. SEATING & LOAD FACTORS INCREASED TO 65%
 72 FLEET 1.65
 MAX. AVAIL. REVENUE PER SEAT/MILE
 % INCREASE IN REVENUE PER SEAT/MILE
 INCREASE IN FUEL CONSUMPTION PER SEAT/MILE
 INCREASE IN FUEL CONSUMPTION PER SEAT/MILE

193,698
 24,921
 116,949
 20,58

DOMESTIC TRUNK & LOCAL SERVICE OR PRIORITIES PASSENGER SERVICE - 1972

Line	DOMESTIC TRUNK & LOCAL SERVICE						LOCAL SERVICE						ALL CARRIER (REGULATED) SERVICE						TOTAL PASSENGERS
	4 TR NR	3 TR FW	4 TR NR	4 TR NR	3 TR FW	2 TR NR	2 TR NR	3 TR FW	4 TR NR	4 TR NR	3 TR FW	2 TR NR	2 TR NR	3 TR FW	4 TR NR	4 TR NR	3 TR FW	2 TR NR	
22	158,932	103,312	491,171	319,037	1,588,214	793,354	430,636	423,711	483,861	453,924	6,020	2,339	1,5						
23	50.5	36.5	9,741	15,212	5,700	3,104	1,638	5,205.7	406	1,647	6,020	2,339	1,5						
24	108.5	113.9	1,115	1,133	1,154	1,221	1,212	1,203	1,111	1,143	1,131	1,155							
25	47.8	99.3	15.1	98.7	16.1	97.6	97.6	99.2	90.6	100.0	99.3	99.3							
26	1,962	1,099	9.3	812	5.5	570	538	117	1,152	816	575	1,531							
27	513	348	3.3	1,570	14.	11.0	11.2	5.6	40.5	19.2	13.9	43.9							
28	37.1	25.3	1.3	116.	10%	857	89.7	48.0	-	-	-	-							
29	507	484	4.9	457	4.3	331	350	60.0	475	467	329	477							
30	463	425	4.1	401	3.3	312	289	132	428	408	295	415							
31	259.43	1,615	6.7	6,874	6,017	4,141	3,914	1,242	1,922	8,876	5,245	2,345							
32	160,678	108,195	62,439	53,214	46,092	32,674	31,331	10,574	-	-	-	-							
33	334	2,138	1,782	2,016	1,323	913	890	310	1,896	1,353	675	2,043							
34	163	12.3	2.9	6.9	6.1	5.6	4.9	2.6	19.4	12.0	8.7	21.1							
35	145.4	101.6	6.7	60.4	57.1	50.8	44.2	23.7	-	-	-	-							
36	35.6	35.1	4.2	45.7	44.4	51.3	44.2	46.2	47.5	52.8	45.9	57.7							
37	45.8	45.4	5.2	51.9	5.1	5.3	4.3	9.3	-	-	-	-							
38	589.22	259,227	1,710,905	731,737	2,400,826	867,357	464,578	160,650	205,246	791,190	5,057	2,339							
39	253.7	110.35	5,444	16,979	70,453	25,422	13,514	4,544	-	-	-	-							
40	1,916	501.4	28,612	8,806	38,862	15,057	6,662	2,236	-	-	-	-							
41	43.8	43.4	31.5	23.2	24.2	24.3	24.1	28.3	9.1	5.8	9.7	9.3							
42	20.1	14.7	16.2	12.0	16.2	19.4	14.3	14.0	-	-	-	-							
43	413.1	1,695	7,946	2,193	7,050	3,261	1,686	533	1,700	406	34	613							
44	2,554	1,104	5,644	1,688	7,045	2,542	1,686	533	911	25	18	355							
45	1,577	591	2,332	475	2,205	719	1,686	533	-	-	-	-							

INTERNATIONAL/TERRITORIAL OPERATIONS OF U.S. PASSENGER/CARGO CARRIERS
 FUEL CONSTRAINED REVENUE PASSENGER-MILE GROWTH



ASSUMPTIONS:

- 1) 25% INCREASE IN AVERAGE PAX. PER AIRPLANE-MILE
- 2) CONTINUED INCREASE IN AVERAGE FLEET PRODUCTIVITY (RPM/GAL)
- 3) CURRENT ROUTE STRUCTURE MAINTAINED & ALL EXIST. MARKETS SERVED
- 4) FREIGHTER FLIGHTS CONTINUE TO SUPPLEMENT PAX L.H.

* EXCLUDING THAT CONSUMED BY FREIGHTER

INTERNATIONAL/TERRITORIAL OPERATIONS OF U.S. PASSENGER/CARGO CARRIERS
 FUEL CONSTRAINED RPM GROWTH I-4

WITH FREIGHTER FUEL RESERVED FOR FREIGHTER OPERATIONS

TOTAL FUEL ALLOCATION AS % OF '72 CONSUMPTION	ACTUALS		MAXIMUM FLEET CAPABILITY RPM (AS)			
	'72	'73 (Estimated from IDMS Data)	'74	'75	'80	'85
MIN. FLEET. 75%			21,147	22,200	25,173	27,200
75%			35,743	35,604	40,372	41,857
100%			40,220	40,273	47,351	48,107
110%			47,391	47,499	55,223	56,233
120%			52,130	52,879	61,512	62,551
130%				57,974	67,204	68,194
150%					80,043	80,903
200%					97,057	97,874
225%					112,114	112,701
250%					127,171	127,551
ABC Fleet	33,584	37,033	40,740	41,200	47,173	48,107
CAB Fleet	24,156	29,275	43,971	47,273		

INTERNATIONAL FLEETS UNDER OPER. BY U.S. AIRCRAFT - 1950 RESULTS - FLEET FUEL CONSUMPTION

TYPE	MAX. RPM (100)	AFM GROWTH FACTOR	MAX RPM (100)	AFM (100)	TOTAL FUEL (100)	GROWTH FACTOR	MAX RPM (100)	AFM (100)	TOTAL FUEL (100)	GROWTH FACTOR	MAX RPM (100)	AFM (100)	TOTAL FUEL (100)
3 TF - M3	463	1.172	23,543	30.7	777,125	1.550	44,933	30.4	391,050	1.409	29,553	30.4	91,450
TOTAL - TF - M3 FLEET	20,269	6.062	25,142	30.31	6,735,125	11.078	4,741	25.34	183,495	16.146	9,266	25.34	30,254
TOTAL - TF - M3 FLEET (EXCL. 100 RPM)	24,114	1.034	25,054	23.33	1,071,600	1.039	25,054	23.33	1,071,600	1.054	24,416	23.33	1,000,000
TOTAL - FLEET (EXCL. 100 RPM)	44,381	5,107.6	50,196	53.64	2,135,015	5,146.8	24,416	53.64	2,135,015	6,113.5	54,500	53.64	2,000,000

0:073

0:10

0:10

0:14

0:10

0:15

0:15

AIPLANE FUEL PRODUCTIVITY - 1972 FLEET
 INTERNATIONAL/TERRITORIAL OPERATIONS OF U.S. PASSENGER/CARGO CARRIERS

