SUMMARY OF SEMINARS

AIRLINE PASSENGERS AND CHANGING AIRLINE COMPETITION
Andrew Elek, Peat, Marwick and Partners

Deregulation

The consensus of the working group concerning deregulation was that the original goals of achieving increased levels of service at lower fares have not changed. The thesis that an imperfect, unregulated industry is preferable to an imperfect, regulated industry, and that the former is more likely to achieve the stated goals, was still considered to be valid and there is no sign that this view is going to change.

Fares and Cost Controls While the ultimate goals have not changed, the expectations have changed somewhat, however, at least in the short and medium term. The original expectations of reduced fares and, at the same time, increased service levels have been dampened or, at least, deferred. It is true that fares did decrease in real terms but they also caused disruptions in the profitability of many carriers.

It is inevitable that, as a result, there will be a retrenchment in the industry. Stabilization of the current situation is expected to occur eventually through significant cost control by the major airlines, which will be key to their efforts to regain profitability in the face of competition from those carriers that can control their costs. The airlines that are unable to control their costs will fail, a prospect that is going to be increasingly recognized by labor.

The cost control is expected to occur, basically, through better productivity of labor, both unionized and non-unionized. It is inevitable that labor must continue to make concessions, a process that appears to have already started. Signs of this start are longer contracts, and some recent settlements that are significantly more favorable than many previous settlements.

Most participants felt that whether a carrier was unionized or not was of smaller importance than whether labor was productive or not. In fact, there are unionized airlines that are more productive than some of the non-unionized airlines.

The question was raised whether the present accommodation with labor may change once traffic started to pick up. It was felt that increased competition would prevent a return of labor's strong bargaining position, particularly in the light of non-simultaneous expiration of contracts.

An excellent approach to higher productivity which appears to be spreading, is to give labor an interest in the profitability of the airlines, and therefore in their productivity, by making the employees increasingly more involved in the profits and ownership of the company and by giving them equity or, at least, profit shares. There are very good examples of some airlines having excellent experience where labor is gaining an increasing share of the ownership of the airline.

It was pointed out that the "major" carriers do not necessarily have to match the fares (or the costs) of some new entrants, since the latter may penetrate a different market: one that trades off convenience with lower fares. This could still leave a large enough market for the "majors", even if they offer higher fares.

Airports The effects of deregulation on some aspects of the system are still to be solved. For example, deregulation has caused some disruptions at airports and will probably cause more in the future, as carriers can move freely from one airport to another. A good example is Florida, where airlines shift from one airport to the other practically at will, influencing traffic to a very large extent by virtually single decisions. This creates problems with regard both to physical activities and financial impacts.

For example, when an airline decides to expand its service at an airport, the airport may expand its facilities and make large expenditures. The airline may later decide to move somewhere else for a variety of reasons. This is quite possible in Florida, where airports are very close and passenger destinations less stable than elsewhere. The airport then becomes burdened by wasted investment. While this problem can be defined as one of the imperfections of deregulation, the solution may be the provision of more flexibility both in financial and in physical terms.

It was noted that airports that are vulnerable to large traffic shifts sometimes find financing difficult. Thus, to improve the financial stability of the airports, the airlines that want to move to an airport might perhaps participate to a greater extent in the financing of the facilities that they need.

In physical terms, deregulation may encourage airports to provide more common facilities. This would certainly improve the utilization of the facilities and may reduce the need for major additions when an airline decides to move its operation to the airport.

Large carriers may theoretically have an advantage over small new entrants at airports, particularly at those where one or two carriers dominate the gates. Although this problem has not yet materialized, there is some fear regarding the future, inasmuch as stronger competition may induce some powerful majors to impede the access of new entrants to airports.

Reservation Systems Another area where deregulation has created some problems is that of reservation systems. Large carriers have made large investments in reservation systems which are being accessed by most agents. The small carriers have to rely on those systems for much of their traffic and these carriers are concerned that the majors may discriminate against them in the way computerized systems are programmed. This concern may increase as competition becomes more fierce. This problem is being presently examined by the Department of Justice.

Over-Capacity An important issue stemming from deregulation is over-capacity. It was generally agreed that there was an over-capacity in aircraft fleets at the present, compared with the times before deregulation. It is difficult at this moment to identify the main reason for the over-capacity, since there are in fact three possible explanations, as explained below. In some cases, all three may be contributing to the problem, but it is not known to what extent.

The first reason is deregulation itself, which means that new entrants add more aircraft to the system than required, either themselves or by taking away traffic from the existing carriers, thus creating over-capacity in the existing fleets.

A second factor that contributes to over-capacity is the fact that some of the jet aircraft is aging: the first deliveries are now almost 25 years old.

However, some carriers refuse to retire these aircraft completely: the aircraft are retired only in terms of hours flown and thus dilute the statistics by being shown as over-capacity.

The third possible explanation for over-capacity is simply the recession.

In summary, it cannot be stated yet with any degree of confidence whether deregulation itself has led or is going to lead to extensive over-capacity, a factor that has to be watched carefully, since it represents probably the strongest threat to the efficiencies resulting from deregulation.

Deregulation Trends: Route Structures

1. Major carrier dominance at hubs. We compared the hub and spoke concept with a concept consisting of smaller aircraft that serve more non-stop routes between small and medium-size locations, "overflying" the hubs. The present situation appears to be that major airlines use hubs to a greater extent than before. One reason for this could be that there is an over-supply of large aircraft and, because of the existence of the large aircraft, the large carriers are forced to use the hub/spoke system at least for some time. The question is whether this system would not change in the more distant future when the fleets can be adjusted to the new deregulation conditions.

2. Increase in point to point routes. A review of costs shows that the transfer of a passenger at a hub probably costs a substantial amount of money for several reasons.

First, the distance between two points may be substantially longer via a hub than on a non-stop basis.

Secondly, there is extra time involved in landing and takeoff at the hub (avoided by a non-stop flight).

Thirdly, there are costs involved in handling the aircraft and the passenger at the hub. When all this is added together and the unit cost per passenger is calculated, it may be that the non-stop transportation of a passenger between smaller places, overflying the hub, could be less costly than transportation through the hub, even though the non-stop plane is likely to be much smaller and therefore costlier per actual seat-hour than the larger aircraft.

An existing carrier would view the hub concept from its own point of view and do what its present fleet requires. The existing carrier would not normally have the small aircraft that would be required for non-stop connections at reasonable frequencies, but would have a surplus of the larger aircraft that typically serve the hubs. However, a new entrant may attempt to provide non-stop service between two points presently served only by a hub/spoke connection.

Suggested New Research

It is suggested that the Transportation Research Board examine this issue and investigate the economies of the two types of movement: (a) the hub, or (b) overflying the hub. The suggested study would show the direction in which a deregulated system may eventually develop rather than duplicate the type of short term studies that airlines may perform. If economic theory was validated, deregulation should move the system in the direction of economic efficiency in the long term. The study would show where such efficiency lies.

Since an important factor in the choice between the hub/spoke or the non-stop decentralized concept is sub-optimization by the airlines, the TRB could perhaps encourage the type of study that would not only address the economies of the total system but also explore the passenger's point of view. The passenger's convenience would be greatly enhanced by having more non-stop services that last only a fraction of the time that a connection through a hub would take. Although the frequencies of non-stop services may be lower than those provided by a hub/spoke system, the final tradeoff is between that inconvenience and the significant gain in actual travelling time. The study may indicate significant net overall advantages for many passengers.

The beneficial side effect of avoiding rather than using hubs might be a reduction in congestion

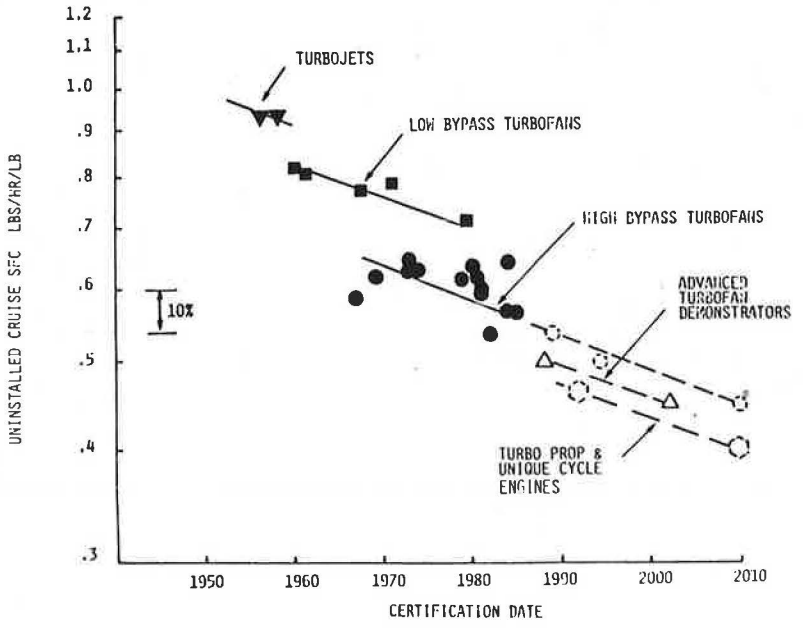


Figure 1. Historical trend of subsonic engine SFC (3500 ft., 0.8 M, STD Day).

at large airports. This could impact on air traffic control problems and prevent the bottlenecks that might occur at some airports. The long-term impacts of the outcome of this study would particularly be useful to the aircraft manufacturers, since they have to plan aircraft sizes for the long term. The study would help the manufacturers by pointing to possible trends and indicate the size range of aircraft that the market may demand in the future.

Is Productivity or Demand Approaching Saturation?

Two types of possible saturation in the airline industry were discussed. The first was saturation of technology, and hence productivity, which impacts strongly upon airline costs and fares. The second was saturation of the demand for air travel.

The technological improvements that are in store for engines and airframes led to the conclusion that for the next 20 years or so, the specific fuel consumption per seat mile is likely to decrease by two percent per year on average. This would be the result of (1) continuing changes in fleet mix, i.e., retirement of fuel-inefficient aircraft; (2) new energy efficient engines; (3) improved wing design; (4) use of composites; and (5) improvements in airline operating procedures. The last item may contribute only 0.2 percent improvement per year. The question is whether these factors will eventually reach a point of saturation. The answer appears to be "no". There are enough technological improvements on the horizon in the long term to ensure the process of continually decreasing fuel consumption, and this process is expected to continue well into the next century. Fuel prices will play an important role in new engine development, since it costs about $50 million in non-recurring costs to achieve a reduction in fuel consumption of one percent.

Figure 1 shows the technological improvement that led to significant reductions in specific fuel consumption (SFC) in the past and shows further improvements that are expected to continue the trend. Table 1 shows that within a particular state of the art, fuel consumption could be reduced further within a five-year period without any technological breakthrough. Figure 2 shows the various technological improvements in store that could lead to reductions in fuel consumption of up to 50 percent compared to the present level. Figure 3 shows the past and expected continuing trend in fuel efficiency, expressed in available seat miles per gallon.

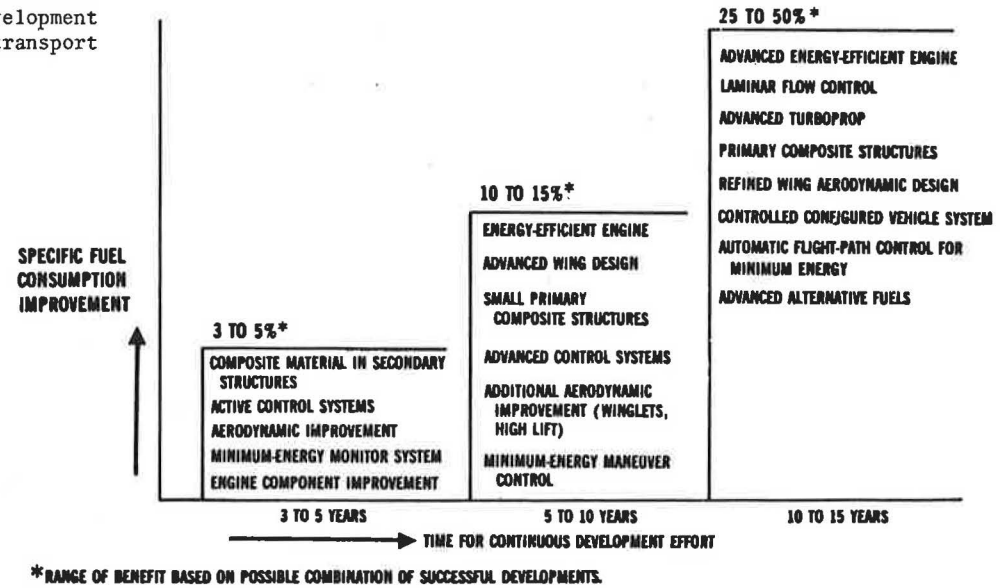
Table 1. Improvements in Efficiency (ASM's per gallon).

	3/78	3/83	% CHANGE
737-200	35.6	46.9	31.7
DC9-30	32.0	39.8	24.4
727-100	31.1	37.7	21.2
727-200	39.8	42.8	7.5
707-300	37.5	37.5	0.0
DC8-61	41.4	43.4	4.8
DC10-10	50.9	54.5	7.0
L1011	48.0	53.4	11.3
747	51.7	51.1	-1.2
A300	44.3	51.6	16.5
			12.0%

Laminar Flow and Fuel Savings

A brief presentation by the National Aeronautics and Space Administration (NASA) showed the progress made in research with laminar flow. This might be the technology that could eventually cut fuel consumption in half. Although some basic in-flight tests are already possible, this new technology may not be commercially available until the mid-1990s. Essentially, laminar air flow (i.e. flow without turbulence) along the wings and, eventually, along all the surfaces of the aircraft, allows a substantial reduction in the power required for propulsion. The key to the economies of the technology is the tradeoff between sharply reduced operating costs and the capital costs of providing the special surfaces required to produce the desired effects.

Figure 2. Technology development leading to improved air transport fuel efficiency.



Turbo-Prop Propulsion

Another new development is a new concept in turbo-prop propulsion. This technology may cause changes that could match the significance of the break-through represented by the jet aircraft 25 years ago. The new approach results in significant reductions in fuel consumption, while achieving speeds almost equivalent to the speeds achieved by jets.

Productivity improvements in areas other than fuel consumption have also been experienced in the past and are likely to continue. Figure 4 may, on the surface, contradict this finding since it shows that in terms of unit costs airline wages rose more rapidly than wages in other industries and much more rapidly than inflation. It also shows the large increase in fuel costs.

Aircraft and Engine Efficiencies

However, the more efficient use of resources, the phasing out of inefficient equipment, and the better utilization of the most efficient equipment resulted in productivity improvements that compensated for the sharp increase in the unit cost of fuel. It was pointed out that, in fact, the total operating cost per seat-mile of the airlines has not changed in real terms to any significant degree during the past ten years. In other words, if it had not been for the ten-fold increase in unit fuel prices (in current terms) total operating costs would have increased less than inflation instead of just keeping pace with it.

Figure 5 shows that in the 1960s the main sources of productivity improvements were increased speed (the change from propeller to jet aircaft) and increases in aircraft size. In the 1970s it was only the latter, however, which continued unabated. The only factor that has not changed was

Figure 3. Available seat miles per gallon (U.S.A.).

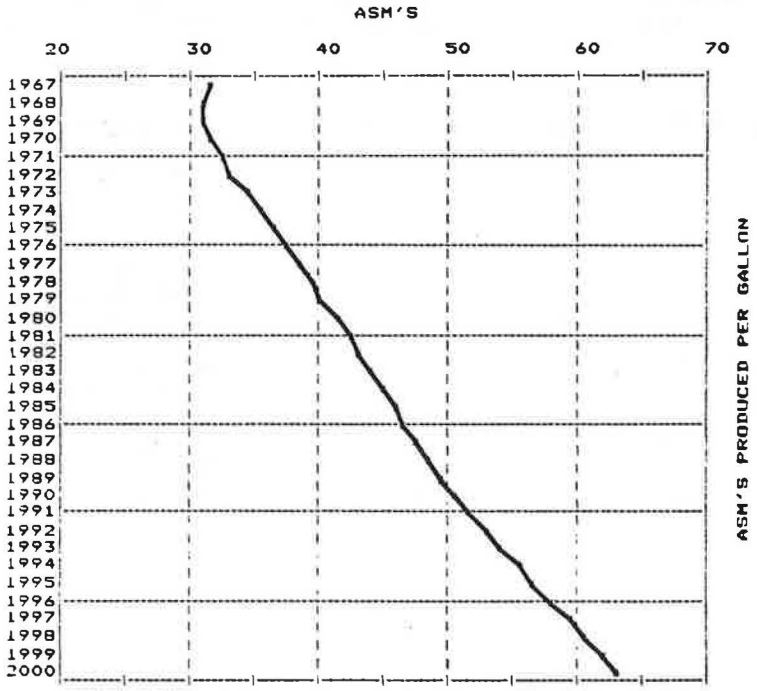


Figure 4. Airline cost trends, short-term scenario.

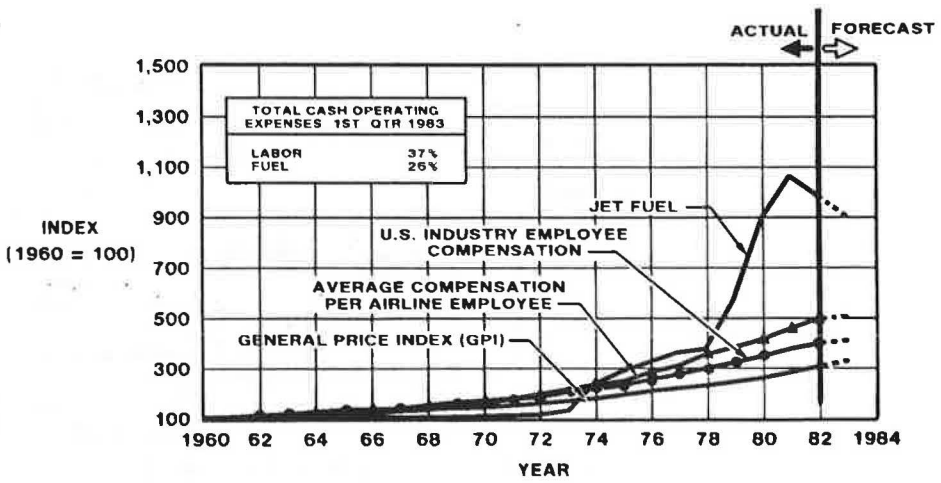


Figure 5. Aircraft productivity in the U.S. airline industry (certificated scheduled airlines).

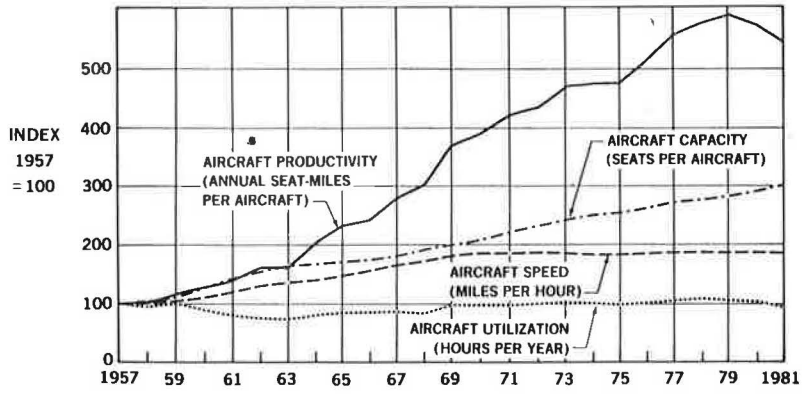


Table 2. Improvements in efficiency (seats per aircraft).

	3/78	3/83	% CHANGE
737-200	100	117	17.0
DC9-30	96	103	7.3
727-100	102	112	9.8
727-200	132	146	10.6
707-300	157	153	-2.5
DC8-61	195	199	2.1
DC10-10	256	267	4.3
L1011	274	287	4.7
747	386	363	-6.0
A300	229	242	5.7
			11.0%

aircraft utilization in terms of flying hours per year. Nevertheless, the total impact of the improvements in terms of annual seat-miles per aircraft has been very significant over the past 25 years. This factor might show a saturating trend, however, as indicated by Figure 5, especially since deregulation may favor the smaller aircraft.

Table 2 shows the extent to which the increase in the number of seats per aircraft contributed to the improvement in productivity. Figure 6 shows the only area in which there appears to be no improvement: the capital cost of aircraft. In fact, this cost component showed a slight increase in real terms over the years.

In summary, there is still room for productivity improvements in many areas, particularly in view of what was noted earlier in the discussion on deregulation. Some airlines have found ways of reducing costs significantly through productivity, which is an indication that saturation in this area is still far off.

Market Growth

As far as demand is concerned, there is no sign of saturation, although some people show model results that indicate some saturation. There appears to be absolutely no proof, however, not even an indication, that would lead to the view that saturation is actually occurring. Although growth rates have decreased, the proposition that the growth in passenger miles will decline below the growth rate of the gross national product is unlikely. Therefore, the limitation in the growth of passenger miles would probably be the growth rate of the gross national product.

Forecasting Models

The panel discussed whether forecasting models are found useful by the users, whether they are used at all, and if so, what types of models are used. The conclusion was that models are useful for macro-analysis and that the models are probably getting less sophisticated rather than more sophisticated.

Complicated and costly market models were available many years ago which were based on detailed surveys. This kind of modeling was appropriate at the time when different population groups behaved differently. However, with today's maturity of the market, there is much more uniformity among people with regard to air travel and the distribution of their characteristics is much smoother. It appears that today econometric models are more useful and certainly less costly than "in-depth" market models. Also, models with many variables do not appear to be much better than models with only a few. Perhaps just two variables, income (or alternately the gross national product) and average airline yield (cents per passenger mile) can describe the macro-environment quite accurately.

The Port Authority of New York and New Jersey has found that a model based on just these two variables tracked air traffic extremely well as witnessed by Figure 7. The model shows total miles flown per capita in the United States, actual and estimated, using per capita GNP and yield representing fare levels as independent variables for estimating the traffic retroactivity. A residual trend term was also used as well as time lags for the GNP (up to one year) and for yields (up to two years). A fare elasticity of -1.2 and a GNP elasticity of 1.2 was used in the estimates.

Problems arise when the model has to deal with details, such as individual airports or individual routes. The problems with airports were addressed earlier. When an airline can move quickly from one airport to the other, when it can choose one hub over another, choose one route structure over another freely, then forecasts for individual airports become very unreliable. The same is true for specific routes, due to new entrants that are unpredictable, and market shares that can change rapidly. In spite of the stable macro-system, traffic on individual routes may vary to a very large extent, particularly that of one particular carrier.

Researchers at McDonnell Douglas experimented with simple econometric equations for forecasting air travel in many countries of the world, based on cross-sectional calibration. They tried to obtain correlations between per capita passenger kilometers and a few simple variables on a worldwide basis. Like the variables used for Figure 7, per capita GNP and average airline yield were used as independent variables. However, because of the diversity in size of the various countries, a third variable had to be added that represented the maximum distance that people could travel within the country. Due to the great diversity among different countries and lack of maturity in many markets, the correlations found in these tests were significantly lower than those indicated in Figure 7, which could be expected. Nevertheless, this work corroborates the proposition that per capita passenger kilometers, per capita GNP and average yield (cents per passenger kilometer) are probably the most appropriate variables for econometric forecasting models.

Scenario Forecasting

Researchers at the Massachusetts Institute of Technology have developed an interesting approach to forecasting the future "look" of the air transport industry in broad terms. The background to these forecasts is a rational process of deduction by a panel of people, who read up on the subject, talk to other people, and logically think through the events that may happen in a particular environment. Tables 3A, 3B and 3C show the outcome of the logical process under three scenarios: "labor peace", "labor turmoil", and "asset play".

The background to Tables 3A to 3C is described in some detail in an M.I.T. report. There is no particular probability attached to either of the outcomes depicted by the tables since the probability of the underlying scenarios is unknown. However, the exercise shows correlations between an external scenario and a possible related outcome.

Exercises of this nature can also be conducted by mail, if necessary, and may cover subjects as

Figure 6. Investment cost per seat (turbine-powered transports).

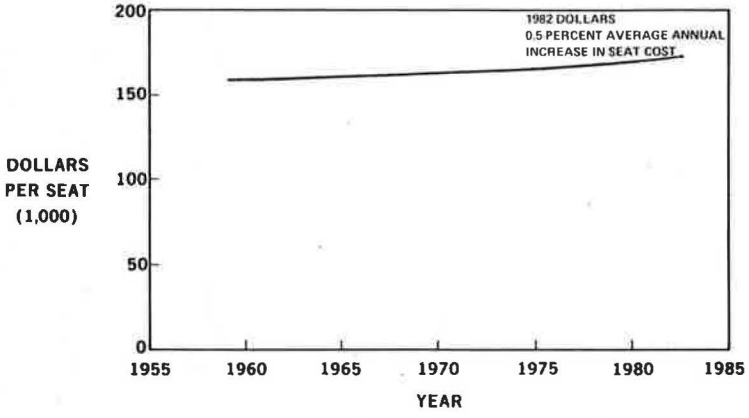


Figure 7. Comparison of actual traffic with forecast.

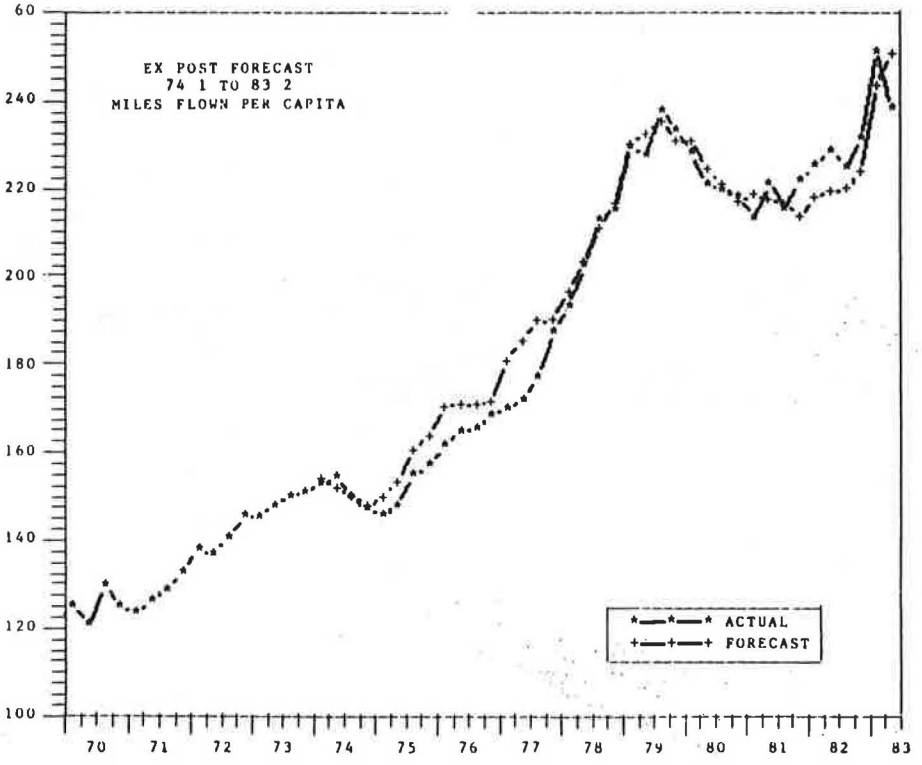


Table 3.

SCENARIO A: LABOR PEACE

TIER	SURVIVORS	MERGERS	DISBANDED/BROKE
1ST TIER (Super-Markets)	American Delta Eastern Pan Am United	TWA/Northwest	Braniff Continental
2ND TIER (Large neighborhood Stores)	Frontier Ozark Piedmont Republic Southwest US Air Western		New York Air Texas International
3RD TIER (Discount Houses and Boutiques)	20-30 (with intermittent changes in name): Midway, People Express, New York Air, Capital, World, etc. Some try to move to 2nd tier (Air Florida)		
4TH TIER (Ma-and-Pa Stores)	About 50-100 commuters (regional airlines with intermittent changes in name). Some try to move to 3rd tier (Altair, Empire, Air Wisconsin)		

SCENARIO B: LABOR TURMOIL

TIERS	SURVIVORS	MERGERS	DISBANDED/BROKE
1ST TIER (Super-Markets)	American Delta United	Pan Am/TWA/Northwest	Braniff Continental Eastern
2ND TIER (Large Neighborhood Stores)	Frontier Piedmont Southwest	US Air/Ozark	New York Air Republic Texas International Western
3RD TIER (Discount Houses and Boutiques)	Same as Scenario A		
4TH TIER (Ma-and-Pa Stores)	Same as Scenario A		

SCENARIO C: ASSET PLAY

	SURVIVORS	MERGERS	DISBANDED/BROKE
1ST TIER (Mega-Markets)		American/Southwest United/Frontier Delta/Piedmont PA/TWA/NW/US Air	Braniff Continental Eastern
2ND TIER		All Survivors merged into 1st tier	Republic Texas International Western
3RD TIER (Small Neighborhood Specialty Shops)	Air Wisconsin Altair Air Cal PSA		Midway People Express Air Florida New York Air
4TH TIER (Ma-and-Pa Stores)	About 50-100 commuters providing feed to 1st Tier		

Source: MIT-FTL Report R82-6: THe U.S. Aviation System to the Year 2000."

broad as shown here or more specific subjects, such as the forecasts of certain events or parameters. It is suggested that such exercises could be conducted by the Transportation Research Board. "Single round" surveys have been conducted by the TRB before; it would be an interesting expansion of such surveys to also ask people for their reasoning behind their responses to the survey questions, followed by a "second round" mailing of the range of responses and the stories behind them. On that basis, people would get an opportunity to revise their views in the light of the opinions of others and approach a standpoint closer to a consensus, producing results similar in structure to those presented in the M.I.T. study.

AIR CARGO

Donald J. Bennett, The Boeing Company

The world air cargo market can be split into four entities: U.S. "Traditional", U.S. "Special/418", International-Developed, and International-Developing. There was general agreement that the U.S. traditional air freight carriers, mostly combination carriers, probably have matured for the time being and will not have very much growth, at least for the next five or ten years. Depending on how much the economy grows, air freight growth might even be zero. More likely it will be positive but less than growth in gross national product. The same evaluation can probably be applied to other developed parts of the world where "traditional" carriers operate within their own developed countries or between developed countries. It is probable that such air freight growth will generally reflect GNP changes.

The outlook is different for the market segment called the "Special/418 Carriers". In the United States, and possibly throughout the rest of the world if freedom for entrepreneurship spreads in the cargo industry, special carriers will constitute a group which has to be recognized. These are the companies like Federal Express, or Emery Worldwide, or small "418" carriers, or other services that have not yet been conceived by some venture capitalist. Growth rates will be very large, much greater than GNP. However, they are growing from a very small base so an extremely high growth rate is not impossible.

Some special carriers, like Federal Express, may have reached a point where their growth rate will have to slow, because they have saturated their market. Either that, or they will have to spread further into other companies' markets, or diversify into new areas such as telecommunications.

In the international arena, air freight growth of the developed nations will generally parallel the growth of GNP maybe slightly higher but not much. However, the total world market is still not mature, and in the international developing nations air freight growth probably will be significantly greater than their GNP growth, and greater than the world GNP growth, in the foreseeable future. These so-called lesser developed countries lack the infrastructure of transport systems. It will take many years to develop rail, highway, shipping or other kinds of transportation systems to or within these countries. Air cargo transport will benefit from that long and expensive developed process.

The total world forecast, then, is a combination of these low growth and high growth segments and the world air cargo outlook can be described as "GNP - Plus". It is not going to grow in great leaps and bounds, and it is certainly not going to explode in five years.

Cargo Forecast Models

From a macro standpoint, modeling is still probably adequate for air cargo. The traditional variables of GNP and yield are still valid, but specific events like fuel disruptions, labor disputes, and other major occurrences must also be considered. At a micro level, especially down to a specific market, modeling is much less applicable. This is true primarily because factors such as prices, routes, capacity, schedules, competitors, and big customers' influence are all extremely important at the micro level and any of these can change on a moment's notice. Thus an econometric model that does not include many of those variables, or is not predictable for those variables has little value.

Whether or not models are used to develop a forecast, a primary decision must be made as to which characteristic of the market will be used to measure cargo magnitude. Will the forecast be expressed as package count, or revenue ton miles (RTMs), or as yield (dollars per package or cents per RTM), or as total revenue? It was suggested that in today's deregulated environment in the United States it may be easier to forecast cargo revenue than other parameters. The reason, of course, is the elasticity of demand. More RTMs can be generated if rates are lowered, and vice versa. If one tries to forecast RTMs, and actual RTMs start dropping below these forecasts, the cargo sales organization probably would discount the price, drop the yield, and recover the RTMs. But that may not increase the revenue. So, in the cargo world, especially the part of the cargo world that is a marginally priced byproduct of a passenger combination carrier, it is probably better to focus on revenue than on RTMs, packages, or yield.

Data Needs

Data problems are rampant in the air cargo industry, even more so than they are on the passenger side. There are all kinds of complications: whether an airline reports to the Civil Aeronautics Board or not, to International Civil Aviation Organization or not, to the International Air Transport Association or not; whether it reports at all. Timely availability of data has declined recently. In some cases the carriers have forced an aging period prior to release of the data to protect proprietary interests. In other cases the process of filing reports and publishing the data has simply slowed down. It can be a time consuming process to evaluate the reliability and consistency of each data source. All of these data gaps and lacks have important negative implications on the ability to make valid air cargo forecasts or even to determine what has happened after the fact.

The Future

What will be the nature of the future air cargo business? Is it going to develop into a business where the air cargo is concentrated in the lower holds of passenger airplanes; or in "combi" airplanes where passengers and main-deck cargo are both carried on the same airplane; or are we going to see a proliferation of freighter airplane operations? Probably both trends will exist. The way the industry develops will reflect the circumstances of the individual marketplace; whether the market is domestic or intercontinental, whether the shipments are very time sensitive or not; whether there is significant competition from other transport models.