

not likely to pose a serious constraint on the realization of FAA demand forecasts. However, increasing airport costs—both out-of-pocket and delay-related—could represent a larger share of air carrier costs, and these are generally reflected in the yield assumptions that FAA has issued in the forecasts.

With short planning horizons, long lead times for approval/implementation of airport projects, limited funding resources, and lumpy investments (where projects are funded incrementally) capacity constraints will occur. This will result in higher costs to the industry either in increased user fees or aircraft delays. However, the panel concluded that airports and airlines should cooperate more closely to facilitate passenger and cargo processing and thereby improve customer service.

Over a longer term, it is not clear whether the current airport infrastructure can accommodate the forecasted doubling of aviation demand without severe strain. There are few signals that capacity problems are emerging, but the onset of significant delays occurs very rapidly at individual sites as the system approaches capacity.

In spite of environmental and land use issues, approximately one-third of the 30 largest U.S. airports have new runways in planning or under construction. According to FAA, the current delivery schedule is one runway per year. Given limited AIP funding levels, this delivery rate was considered optimistic by some panelists. It was the panel's feeling that this pace is too slow and could threaten the FAA forecast. Because of the long lead times involved, additional infrastructure projects need to be started now to keep pace with growth. If additional capacity cannot be achieved, costs will rise and some diversion to automobiles or new telecommunications options can be expected.

It was also noted that, following the construction of Denver International Airport, no new U.S. airports have been planned. More attention will likely need to be paid to the aviation infrastructure question in future workshops.

Advanced technology, improved efficiency of airport operations, and the potential increase in size and productivity of new aircraft will offer some relief for accommodating increased passenger demand without airport expansion. Considering the current status of the national system of airports and the estimated costs of new investments required for airport and infrastructure maintenance and development, the panel suggested that FAA carefully review the costs implied by the unconstrained traffic forecast and the resulting potential impact on demand.

Whatever the outcome of specific issues, the panel recognized that airports must be viewed as a system—serving passengers, cargo and aircraft activity—rather than as individual airports. This is critical to understanding airport problems. Airports, rather than ATC, will likely be the cause of system

constraints.

FLEETS AND MANUFACTURERS

Panel Co-chairs:

Billie Jones	Gary Ives
Pratt and Whitney	Hurel-Dubois Limited

Panelists:

Simon Beech	John Walsh
Lucas Aerospace	Walsh Aviation
Derrick Maple	Kenneth Holden
Smiths Industries Aerospace	GE Capital Aviation Services
Marie Bjornson	Alvin Wang
Volvo Aero Corporation	Pratt & Whitney
Arnold Schwartz	Philippe Klinger
Federal Aviation Administration	SNECMA
Philip Bolt	Martin Wiedra
British Aerospace Asset Management	MTU Munchen
Vernon Thomas	Mike Lee
GE Aircraft Engines	Messier-Dowty, International
Vicki Golich	
California State University San Marcos	

Introduction

The discussions of the Fleets and Manufacturers panel consisted of three parts. First, the entire panel met with panels on Domestic Air Carriers, International Airlines, and Regional and Commuter Airlines. (The report of this joint activity is the first article in this panel discussion series.) Second, a review of the forecasts submitted by each participant prior to the formal conference was compared with a consensus set of figures derived from the data. Third, discussions were held about the forecasting issues identified as key issues and those that were difficult to assess. Additional consideration was given to the issues raised in the joint meeting to determine the points of view expressed by the airline panels.

Forecasts

The consensus forecast of the panel was that worldwide passenger traffic would grow at an average compound rate of growth of 4.83 percent over the next 20 years. For 5 year periods from 1997-2016, the growth rates projected are 5.38 percent, 4.90 percent, 4.65 percent, and 4.46 percent. The range of forecasts from the ten participants ranged from 4.5 to 5.4 percent (Figure 1). Similarly, the panel forecast U.S. passenger traffic to grow at a compound rate of 3.67 percent for the twenty year period 1997-2016 and 4.07 percent, 3.75 percent, 3.64 percent, and 3.12 percent for the five year periods 1997-2016 (Figure 2). Eight of the firms participated in the U.S. forecast. (The panel did not compile data for US-only operators, therefore FAA forecast worksheets were not completed and submitted.)

The worldwide average load factor was predicted to increase from 68.7 percent in the current five year period to 69.8 percent (Figure 3) in the final five-year period. The resultant effect of the increased load factor is to increase aircraft productivity, reduce the number of additional aircraft required to service the traffic, and increase the opportunity for additional revenues for the airlines.

Deliveries of turboprop and small jet aircraft (fewer than 80 seats) were projected to be 5,800 aircraft (Figure 4) with retirements in the same category as 2,900 (Figure 5) and therefore a net fleet growth of 2,900 aircraft over the twenty year period. For the fifteen-year period, the deliveries were projected to be 4,390, retirements projected at 2,010, and net fleet increase of 2,380.

The world passenger jet fleet deliveries (80 seats and over) were forecast at 13,170 aircraft (Figure 6) with retirements of 5,900 (Figure 7), resulting in a net increase of 7,270 aircraft over the twenty year period (Figure 8). For the fifteen year period, the deliveries were projected to be 9,700, retirements projected at 4,340, and a net fleet increase of 5,360 (Figure 5). The rate of increase of deliveries of aircraft 80 seats and over for the twenty year period averages 658 aircraft which is higher than the average delivery rate for the prior ten year period by 10 percent.

A continuing concern that has been expressed for several years is the difficulty of forecasting aircraft retirements. Although the numbers of Stage I aircraft that have been retired are substantial, the breadth of aircraft types that would be potentially retired in Stage II is much greater. In addition, an aggressive hushkit program has changed most retirement assumptions. Observations were made in the panel discussion sessions about the small potential secondary market for widebody aircraft and the potential shorter operating life for that type. Structural life of all Stage II aircraft is longer than the achieved life of any current aircraft. However, the economic lives of those aircraft are still to be determined.

Qualitative Issues

Although the projections of deliveries and retirements are the end results of the panel's deliberations, the underlying issues that drive the forecasts are instrumental to the computational process. As shown in the accompanying figures, the assumptions and calculation methodologies of the participants vary substantially. However, the basic economic and operational parameters used for the forecasts are well defined. The panel members expressed concern that economic projections and their relationship with airline traffic failed to reflect actual short-term traffic in a number of cases. They were also concerned with the assumptions that the econometric forecasting firms used to determine trend-line projections. Since the current economic expansion is nearing record length anticipation of cyclical downturns in the next few years weighed heavily in the discussions.

Panelists were asked to rate various issues prior to attending the conference. These issues were in three categories: industry growth, aircraft retirements, and airline changes. In addition, panelists were encouraged to submit other issues of concern, and they responded with 30 suggestions. Tables 1 and 2 display the top five issues which were found to be the most important issues and to be the most difficult issues to forecast in five-year increments.

Economic Growth and Aircraft Retirements

The overriding issue that dominated discussions was the effect of economic growth and the resultant airline traffic in most regions of the world. Relative to U.S. traffic, the panel members were concerned that projections of traffic for the U.S. were substantially lower than actual data for 1996 and for the first two quarters of 1997. Although the data are substantial in the United States due to DOT filing requirements, reports from outside the U.S. are not as robust with detailed data. Similarly, aircraft retirements driven by age or by high numbers of cycles on the airframe were high on the concern list. Although hushkitting has been recognized as an appropriate means of achieving lower standards of noise, the projection of hushkit sales was not widely understood—with the exception of the Pratt & Whitney representatives.

Congestion

One topic that elicited substantial discussion was the effect of continued levels of traffic growth in certain world regions, particularly the United States. While the movement toward smaller RJs would seem to increase

the potential for congestion, the increase in point-to-point operations may actually alleviate some congestion. Additionally, proposed aircraft larger than current B-747s would address the opposite end of the congestion spectrum. Although the panel did not take a position on the need for larger aircraft, it did recognize the issues that the larger aircraft would introduce.

Emerging Markets

During previous TRB forecast workshops, concerns have been expressed regarding the development and stability of aviation systems in the Commonwealth of Independent States (CIS), Eastern Europe, the People's Republic of China, and in key high growth economies in Asia. In certain countries continued projections for high economic growth give some cause for concern. Additionally, the replacement of nonwestern aircraft in those systems are hard to project. While substantial movement has been made toward Open Skies in Western Europe, the timing of similar liberalization in Asia is unknown. Over the next decade, the potential for substantial western aircraft deliveries in the CIS and in Asia is enormous—provided that economic and political stability continues.

Airline Operational Costs and Revenues

World and U.S. airlines have achieved record profits in the past few years due to the expanding economies coupled with judicious cost controls. Although pressures will increase for higher wages as labor contracts are renegotiated, the airlines have been examining every cost element in their operations. Reduction of direct as well as indirect costs has provided significant savings while innovative means of acquiring aircraft have allowed for substantial fleet renewal. In some cases this has shifted the cost pressures onto the

aircraft, engine, and aircraft component suppliers. Yield management has achieved new levels of sophistication resulting in higher realized revenues and record high load factors. Although the panel expressed pleasure in both trends, there was concern expressed about the discipline required by the airlines to continue the trend.

Alternate Modes of Travel/Communication

The panel expressed concern about the effects of alternative modes of travel and of communication over the next 20 years. Although some initial studies have been done showing the effects of videoconferencing, there was skepticism about the validity of the data due to the rapid development of communication technologies. Similarly, with the emphasis in Europe toward replacing short-haul air trips with rail and road alternatives, the panel felt that the second decade of our forecast should consider these alternate travel modes for their effect on air travel.

Summary

The forecasts for the Fleets and Manufacturers panel were assessed to be pragmatic, based on the projections of economic growth and the retirement models utilized. Although no economic cycle analysis was systematically included in most of the forecasts, the resulting projections of deliveries showed a pronounced variation over time. This resulted from the panel members' concern about another potential boom-and-bust delivery scenario that might result from air carriers' short-term overbuying of equipment. However, the panel members demonstrated their continuing optimism for the aircraft market by enthusiastic discussion of improved forecasting techniques as well as by generating positive forecasts.

**FORECASTS OF TWENTY-YEAR WORLDWIDE TRAFFIC GROWTH
DISPERSION AROUND THE MEAN (4.83%)**

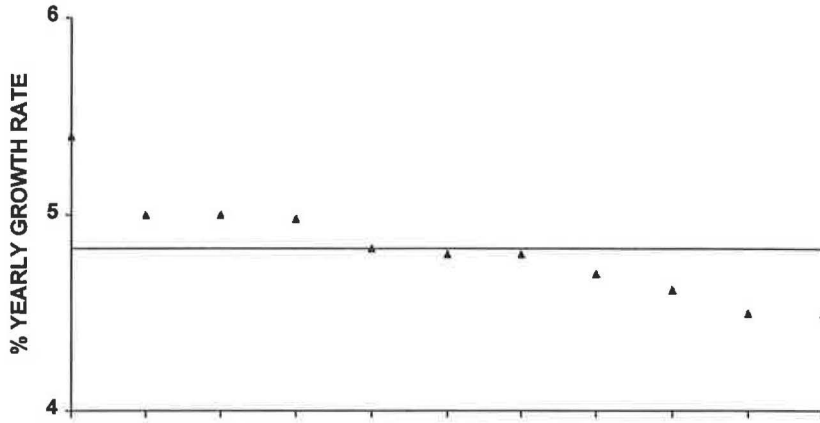


FIGURE 1 Forecasts of twenty-year worldwide traffic growth: Dispersion around the mean (4.83 percent).

**FORECASTS OF TWENTY-YEAR U.S. TRAFFIC GROWTH
DISPERSION AROUND THE MEAN (3.67%)**

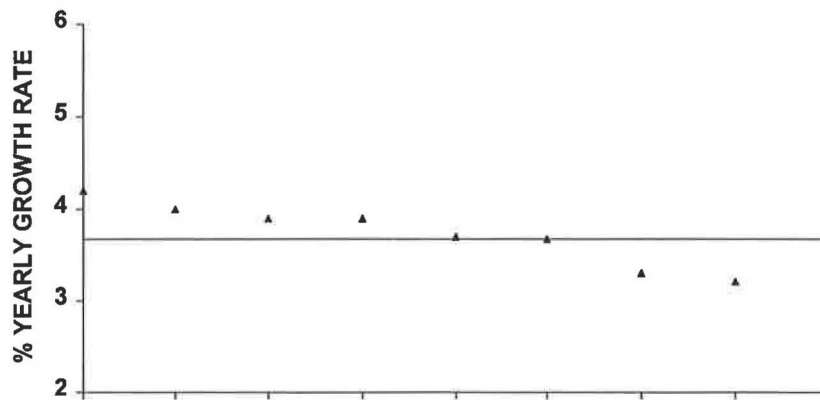


FIGURE 2 Forecasts of twenty-year U.S. traffic growth: Dispersion around the mean (3.67%).

FORECASTS OF MEAN TWENTY-YEAR WORLDWIDE LOAD FACTOR
DISPERSION AROUND THE MEAN (69.84%)

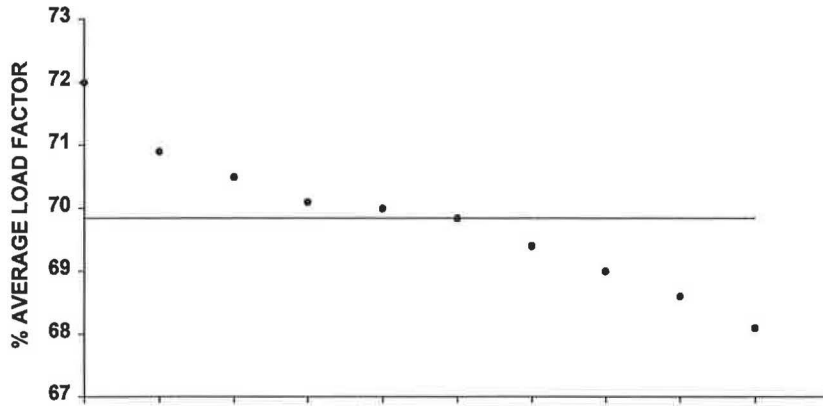


FIGURE 3 Forecasts of mean twenty-year worldwide load factor: Dispersion around the mean (69.84 percent).

AIRCRAFT LESS THAN 80 SEATS DELIVERY FORECASTS
DISPERSION AROUND THE MEAN 20-YEAR TOTAL (5,810)

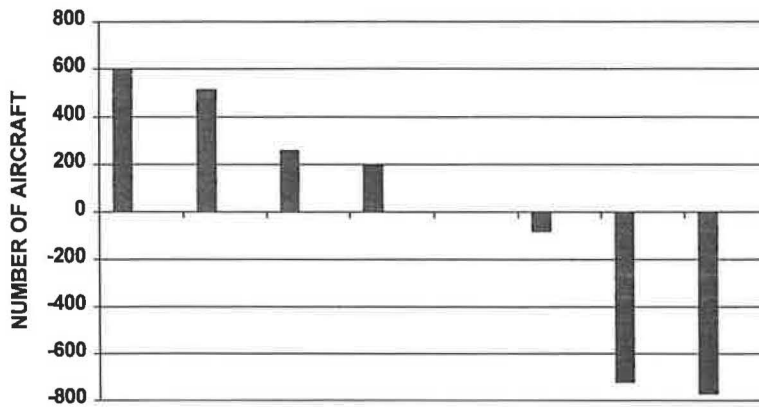


FIGURE 4 Aircraft less than 80 seats delivery forecast: Dispersion around the mean 20-year total (5810).

AIRCRAFT LESS THAN 80 SEATS RETIREMENT FORECASTS
DISPERSION AROUND THE MEAN 20-YEAR TOTAL (2,942)

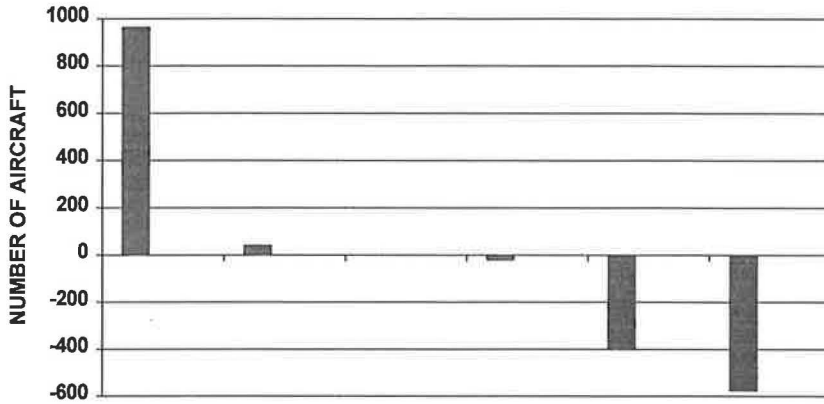


FIGURE 5 Aircraft less than 80 seats retirement forecasts: Dispersion around the mean 20-year total (2,942).

AIRCRAFT GREATER THAN 80 SEATS DELIVERY FORECASTS
DISPERSION AROUND THE MEAN 20-YEAR TOTAL (13,167)

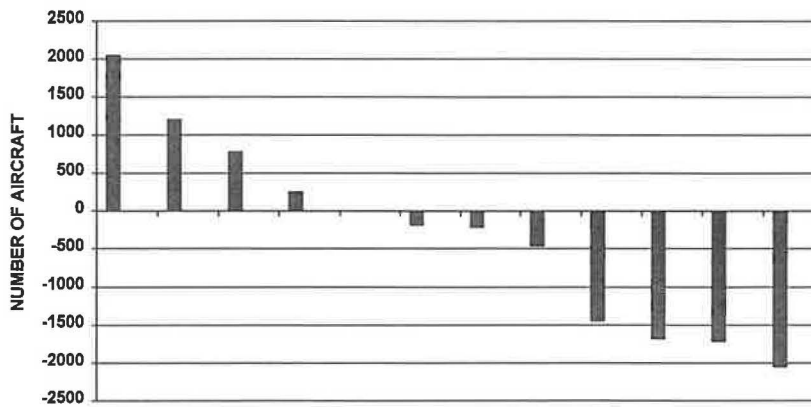


FIGURE 6 Aircraft greater than 80 seats delivery forecasts: Dispersion around the mean 20-year total (13,167).

AIRCRAFT GREATER THAN 80 SEATS RETIREMENT FORECASTS
DISPERSION AROUND THE MEAN 20-YEAR TOTAL (5,915)

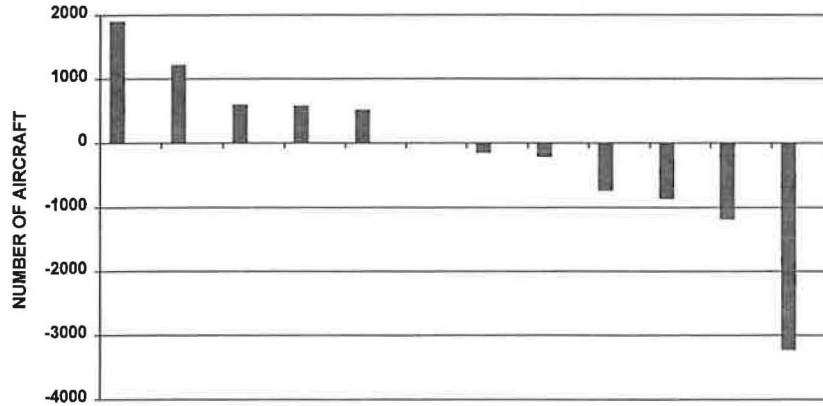


FIGURE 7 Aircraft greater than 80 seats retirement forecasts: Dispersion around the mean 20-year total (5,915).

JET AIRCRAFT ABOVE 80 SEATS
AVERAGE OF FORECASTS OF DELIVERIES, RETIREMENTS, AND FLEET

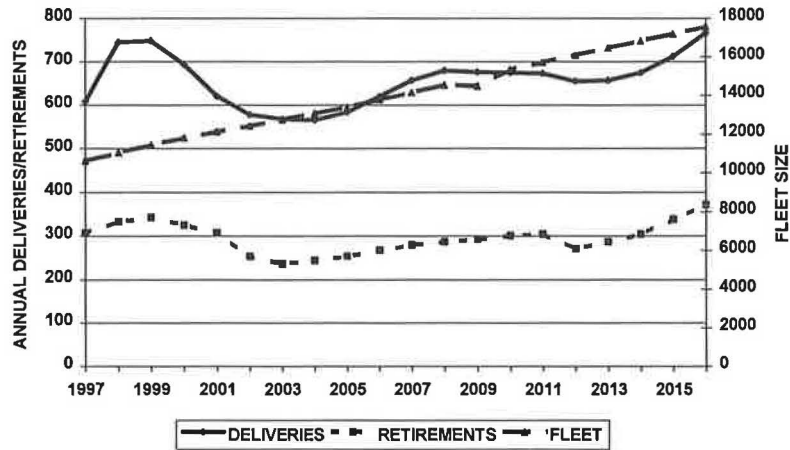


FIGURE 8 Jet aircraft above 80 seats: Average of forecasts of deliveries, retirements and fleet.

Table 1

DIFFICULT ISSUES TO FORECAST			
First Five Years		RAW	WEIGHTED
	Economic growth and stability, linkage to traffic	8	28
	Yield management/pricing policies	5	19
	Asian high growth economies - boom or bust	5	18
	"Ageing"/high-cycle aircraft concerns	5	15
	Re-engining/hush-kitting	4	9
Second Five Years			
	Eastern Europe, C.I.S., emerging economies	5	18
	Economic growth and stability, linkage to traffic	6	17
	Hub "fracture" vs. "consolidation" in Europe and Asia	5	16
	Congestion as a growth constraint	4	13
	Asian high growth economies - boom or bust	3	10
Last Ten Years			
	Economic growth and stability, linkage to traffic	6	23
	Eastern Europe, C.I.S., emerging economies	6	22
	Congestion as a growth constraint	5	15
	Alternate modes of transportation, alternate modes of communication	6	14
	Rate of Technology change	5	13

TABLE 2

IMPORTANT ISSUES IN DETERMINING FUTURE AIRCRAFT DELIVERIES			
First Five Years		RAW	WEIGHTED
	Economic growth and stability, linkage to traffic	9	33
	Cost of airline operations vs. airline profits	5	17
	Availability of/affordability of capital	4	15
	"Ageing"/high-cycle aircraft concerns	4	15
	Re-engining/hush-kitting	6	13
Second Five Years			
	Economic growth and stability, linkage to traffic	7	28
	Congestion as a growth constraint	5	20
	Hub "fracture" vs. "consolidation" in Europe and Asia	5	15
	Asian high growth economies - boom or bust	4	15
	"Ageing"/high-cycle aircraft concerns	6	13
Last ten years			
	Congestion as a growth constraint	9	25
	Economic growth and stability, linkage to traffic	5	24
	Alternate modes of transportation, alternate modes of communication	6	18
	Cost of airline operations vs. airline profits	5	17
	Hub "fracture" vs. "consolidation" in Europe and Asia	5	10