PART I FORECASTING GENERAL AVIATION ACTIVITY

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SUMMARY

Forecasting general aviation activity is increasingly difficult because of changes in public policy, a greater reliance on market forces, infrastructure constraints, changes in the pilot population, and shifts in general aviation flying patterns. Nonetheless, timely and accurate forecasts are important to the Federal Aviation Administration, state and regional planning agencies, and the general aviation industry--all of whom are interested in improving the operation and safety of the nation's air traffic system, and increasing the level of transportation services provided. Because of the wide interest in FAA general aviation forecasts, it is important that FAA identify deficiencies in current general aviation data, develop methods for getting around any deficiencies, and continually improve FAA data collection and forecasting methods. The findings summarized below are listed according to the organization of the full workshop report. The foundation for any forecast, regardless of forecasting method, is complete and accurate data.

Despite the difficulties over recent years in generating accurate general aviation forecasts, one should not discard traditional statistical forecasting techniques. In addition to possessing desirable statistical and modeling properties, econometric models are able to explain historic movements in general aviation acitivity. Econometric models can generate relevant base line forecasts over reasonably long forecast periods.

Finding: Traditional forecasting models are valuable tools, and FAA should continue to use them in projecting future general aviation activity.

However, it is unreasonable to expect statistical models to capture all of the nuances of GA activity, especially in the dynamic environment of the 1990s. For this reason, it would be prudent for FAA to develop alternative forecasting methods and approaches to augment traditional statistical methods. Likewise, FAA should develop alternative data sources describing GA activity and to take advantage of GA data collected by state and regional planning agencies.

Finding: Alternative forecasting methods can also be used to advantage.

In particular, the use of pilot certificate data, when combined with data from the General Aviation Activity and Avionics Survey, can provide indications of trends and causes underlying growth patterns. Periodic publication of information about the pilot population would be a valuable addition to the GA data base.

Forecasts are only as good as the data feeding them. FAA should continue efforts to protect the integrity and representativeness of the data collected through the General Aviation Activity and Avionics Survey. Other surveys to gather information not now available about GA activity should also be considered.

Finding: The quality and utility of GA data and surveys could be improved in several ways.

Efforts should be made to:

(a) revise the General Aviation Activity and Avionics Survey form to make it less imposing and to apply stratified sampling techniques to insure representativeness;

(b) gather activity information from aircraft operators rather than registered owners;

(c) separate commuter operations from other GA activity categories in statistical reports and summary measures;

(d) develop and report summary GA activity measures by flight-hour groups,

(e) reinstitute periodic surveys of fixed based operators (FBOs) and report GA flight activity based on IFR flight plans, and

(f) develop better information on GA import and export activity, both for the active fleet and new aircraft production.

INTRODUCTION

Forecasting air traffic and aviation activity has become a difficult task. Airline deregulation, along with a public policy orientation toward greater reliance on market forces, has created concern about the nation's transportation system and uncertainty about its capacity to support continued growth in air travel. In a changing and uncertain environment it is important to have timely and accurate forecasts. FAA and state agencies need reliable forecasts to develop plans to accommodate increased air traffic, while maintaining safety, improving the quality of service, and increasing system efficiency. The payoff for private industry from improved forecasts shows up in more rational production plans, reduced costs, and increased profits.

In response to the need for better general aviation forecasts, the Federal Aviation Administration requested that the Transportation Research Board (TRB) sponsor a special workshop to review and discuss (1) recent trends in general aviation activity, including fleet size, flight hours, and new aircraft shipments, (2) current forecasting practices, (3) issues and problems related to data collection and reporting, (4) alternative data sources and forecasting strategies, and (5) issues which may affect long-term forecasts of general aviation activity. This report summarizes the discussions and presents suggestions made during the workshop.

BACKGROUND

A major trend in general aviation (GA) is the growing divergence between nonbusiness flying and business flying carried on with for-hire pilots. The two segments are different in function and services provided and in the way market forces and public policy affect them.

While single-engine piston aircraft, with over 160,000 units, constitute the largest part of the active GA fleet, the production of new single-engine aircraft has virtually vanished. In 1978 GAMA members shipped over 17,800 units, but new production has declined 96 percent, with approximately 628 new piston units shipped in 1989. This market contraction portends diminished personal flying hours as fleet attrition begins to take its toll on the active piston fleet. Shipments of new turboprop and jet aircraft also declined substantially during the early 1980s. Nonetheless,the U.S. domestic fleet has grown modestly, with a commensurate increase in flight hours. Overall, however, it appears that GA is losing market share to commercial carriers in providing air travel services.

In the discussions that follow, the level of GA activity is measured in terms of fleet size, flight hours, and new shipments. The population of active pilots and student pilots is examined as an indirect indicator of future aviation activity. Unfortunately, detailed data on general aviation exports and imports, and fleet attrition due to obsolescence and other factors are not available. Operating cost data are collected by FAA, but these may not be reliable because of differences in interpretation of terminology by survey respondents. Frequency of flights and origin-destination information are not currently published, although partial data are collected through IFR flight planning. This kind of information would be particularly useful in assessing GA peak-load demands, air system capacity constraints on GA activity, and GA use patterns, as they affect forecasts.

At one time, FAA sent the Activity and Avionics Survey to all aircraft owners, with a response rate of approximately 75 percent. Presently, FAA constructs estimates of fleet size, total flight hours, and other measures of GA characteristics and activity using annual survey data collected from approximately 30,000 aircraft owners. The reliability of the estimates derived from the Activity and Avionics Survey are coming under question because: (1) the survey is sent to registered owners rather than operators, while (2) the transfer of ownership is not always properly accounted for in the Federal registry; (3) many aircraft listed on the registry are no longer operable (i.e., "dead" aircraft); (4) there is a great deal of heterogeneity among owners, who range from individuals operating single-engine piston aircraft for recreational use to Fortune 500 corporations operating fleets of large general aviation jets internationally; and (5) a response rate which may be too low to reflect accurately the GA flying population. Because of the diversity among the flying population, the current response rate (although exceeding 60 percent) may underrepresent some segments of GA users. Because of budget constraints, it is difficult for the FAA to address some of the sample survey problems and develop uniform definitions and standard terminology that cover both the personal flyer and the corporate operator.

Furthermore, FAA forecasting efforts have been complicated by infrastructure constraints and regulatory and market changes that have occurred since 1980. New statistical models and forecasting methods may be needed to reveal the shifts that have taken place in the purchase and use of GA aircraft. For example, Mayer (Transportation Research Circular Number 348, August 1989:9-29) notes that econometric prediction of air traffic using the data generated during the regulatory period tends to underestimate the actual growth path in commercial air traffic under deregulation. Older statistical models do not pick up this change.

FAA recognizes the need to develop better long-term GA forecasts and placed the following questions on the workshop table:

1. What are the deficiencies in current FAA data?
2. How can FAA get around these data problems?
3. How can FAA improve its data collecting and reporting?
4. How can FAA improve its methods of working with current data?

TRADITIONAL ECONOMETRIC MODELING

Despite the difficulties over recent years in generating accurate general aviation forecasts, one should not dismiss the applicability and usefulness of traditional econometric techniques when modeling GA activity. However, to develop the best possible forecasts, the forecaster must be aware both of the strengths and weaknesses of statistical models and techniques. Of course, the quality of data limits the forecaster's ability to anticipate the future regardless of statistical prowess. Some of the inherent weaknesses in econometric modeling can be overcome by augmenting statistical results with other kinds of information, and judgments always are an important component of a good forecast.

The use of econometric methods forces the modeler to reveal basic relationships, define important variables, and make explicit assumptions about external events or factors. An econometric model is unambiguous in what is included in constructing the forecast and equally clear about what is not. This kind of disclosure is especially important to the user of forecasts since the model structure and assumptions drive any forecast. If a model is developed thoughtfully and if assumptions about external conditions are reasonable, the forecast results will likely gain acceptance.

Econometric models permit sensitivity analysis and thereby allow the forecaster to evaluate the robustness of the forecasts generated. At the same time, by playing out alternative scenarios, it is possible to identify factors that are especially critical in determining forecasted outcomes. The user of the forecast can track the critical background variables and revise or modify actions if some of these critical variables deviate from initial assumptions.

Although often overlooked, forecast errors can be used as a diagnostic tool to improve subsequent forecasts. Forecast errors often result from incorrect assumptions about external events, rather than from using an inappropriate model or incorrect parameter values. By comparing actual background conditions with initial assumptions it is possible to identify where or why a specific forecast broke down. This information can be used to evaluate the structure of the econometric model and identify where greater attention is needed in developing assumptions about future background conditions.

Of course, econometric models include only those things that are observable and measurable; that is, those factors that are quantifiable. As a corollary, forecasts are only as good as the data available. There are many things that seem to affect GA activity that can not be quantified--tastes and preferences for recreational flying, for example. Others, such as the "hassle" associated with flying because of crowded airspaces or limits on airport access, are not measured well. Still other influences are difficult if not impossible to anticipate. The shipment forecasts presented below, for example, do not take into consideration future technological advances or new product introductions. Forecasts based on alternative data sources are one way of checking for these influences, and professional judgment can be used to adjust statistical results for those factors that can not be quantified.

The forecasts presented below demonstrate that a statistical model can tell a lot about future general aviation activity, thereby minimizing the data requirements and allowing for timely forecasts. The following guiding principles played a strong role in developing the forecasts:

1. The econometric model(s) should be simple as possible.
2. The data requirements should be minimal.
3. The model should reflect behavior of GA participants.

Figure 1 presents a stylized picture of general aviation activity and focuses on the relationship between market forces that determine sales of new general aviation aircraft and the factors that determine the use of aircraft in the GA fleet. In the absence of detailed discussion tracing out the various links in this picture, simply note that the forecasting model described below is consistent with this structure.

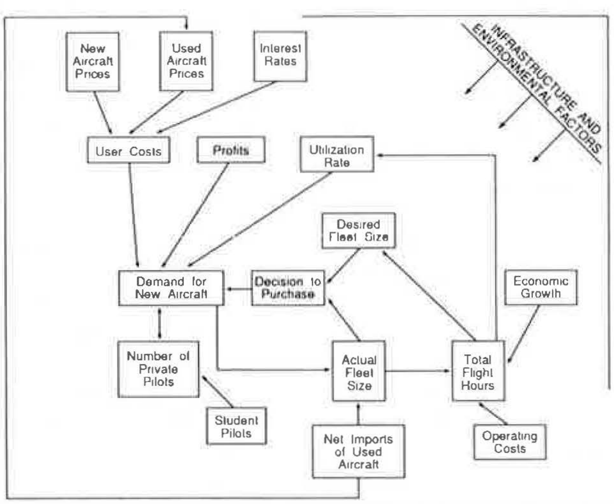

FIGURE 1 Model of the General Aviation Industry

The following three-equation recursive model is used to develop forecasts of new shipments, fleet size, and total fleet hours. New shipments refers to worldwide production of new GA business aircraft, while fleet hours and fleet size reference the U.S. domestic GA fleet.

A SIMPLE GA FORECASTING MODEL

(1) Fleet Hours = f(Fleet Size, Real GNP)
(2) Fleet Size = g(Lagged Fleet Size, New Shipments)
(3) New Shipments = h(Lagged Price,Lagged Retained Earnings, Lagged Foreign Exchange Rate)

Equation (1) is a reduced-form expression capturing supply and demand factors that determine the level of transportation services produced each period. Fleet size is a supply variable measuring GA capacity to provide transportation services. Real GNP is a demand variable reflecting the notion that the demand for transportation services is derived from real economic activity.

Equation (2) looks like an accounting identity, but it is not. The equation acknowledges that the size of the current fleet is linked to the net flow of aircraft from the previously existing fleet and the flow of new aircraft from current production. The international flow of new and used aircraft, however, makes this more complex than a definition, and the effect of GA exports and imports is captured by the estimated parameters on the two right-hand variables.

Equation (3) is a demand relationship for new aircraft. The right-hand variables are lagged under the assumption that there is a production backlog. Current shipments reflect purchase decisions made in the previous period. Retained earnings are included under the hypothesis that internal money is not perfectly substitutable for external money, and therefore important in determining the level of corporate investment in plant and equipment.

Notice the system is recursive: shipments from (3) are substituted into (2), driving the forecast for fleet size. Forecasted fleet size from (2) is substituted into (1) and drives the forecast for fleet hours.

Separate turboprop and jet models are estimated because turboprop and jet markets react differently to changing conditions. The models are then solved using predicted values for the external factors (exogenous variables) to derive forecasts for new shipments, fleet size and total fleet hours over 1989-1995, a seven-year forecast period.

The exogenous variables are real GNP, corporate retained earnings, the trade-weighted foreign exchange rate, and sales-weighted average prices for new turboprop and jet aircraft. Except for price, DRI forecasts are used for the future values of these variables. Sample period values for the price variables calculated by the authors are presented in Table 1. It is assumed that real weighted average prices remain constant at their 1989 level over the forecast period. This assumption about average price implies that either real purchase prices and the sales composition remain unchanged, or that any changes in these balance, to keep real weighted average purchase prices constant.

TABLE 1 Average Weighted Prices for New Jet and Turboprop Aircraft

Year	Jets	Turboprops
1968	3187031	1301912
1969	3092311	1389404
1970	3165954	1458422
1971	3243670	1345861
1972	2694400	1452323
1973	2434449	1416314
1974	2534442	1345116
1975	2811177	1375654
1976	2872769	1444296
1977	3136361	1419250
1978	3322361	1394576
1979	2974151	1403982
1980	3460905	1391702
1981	4134497	1520219
1982	4919614	1611373
1983	5021009	1740863
1984	5425024	1844443
1985	4859130	1957926
1986	5430730	1980830
1987	6822952	2111719
1988	7430821	2164306
1989	7588670	2053380
1990p	7588670	2053380
1991p	7588670	2053380
1992p	7588670	2053380
1993p	7588670	2053380
1994p	7588670	2053380
1995p	7588670	2053380

Base year = 1980
Weights = new unit sales
p denotes year in which a predicted value was used for generating forecasts

Source: Calculated by authors

The endogeneous variables are new GA business aircraft shipments, fleet size, and fleet hours. Annual fleet size and fleet hour data are derived from FAA publications, based on the "General Aviation Activity and Avionics Survey." Annual shipment data are derived from General Aviation Manufacturers' Association (GAMA) reports and "Business Aviation." The latter reports shipments for non-GAMA members and is used to augment the GAMA reports.

Actual values for new aircraft shipments, fleet size, and fleet hours for the sample period 1970-1988 are shown in Tables 2 and 3; columns 2, 4 and 6 respectively. New shipment data are available for 1989 and shown also. Predicted and forecasted values for shipments, fleet size, and fleet hours are shown in columns 3, 5,and 7. It is useful to refer to Figures 2 through 7, which compare actual with predicted values over the sample period 1970-1988, and present forecast values over for the years 1989-1995. Consider first, general aviation jet aircraft and Figures 2-4.

The simulations from the general aviation jet model appear to track well with the historic series. The estimated shipment equation (see Figure 2) does not pick up the record 1981 peak in new jet shipments, but general aviation manufacturers were extremely optimistic about future sales and produced (and therefore shipped) a great many aircraft in anticipation of sales. Similarly,over the 1984-1987 sub-period, the fleet size equation underestimates actual jet fleet size. Finally, the model misses the abrupt changes in jet fleet hours in 1972, 1975, 1981, and 1987. Nonetheless, there is a rather large systematic component in jet hours, and this is captured by the fleet hours equation.

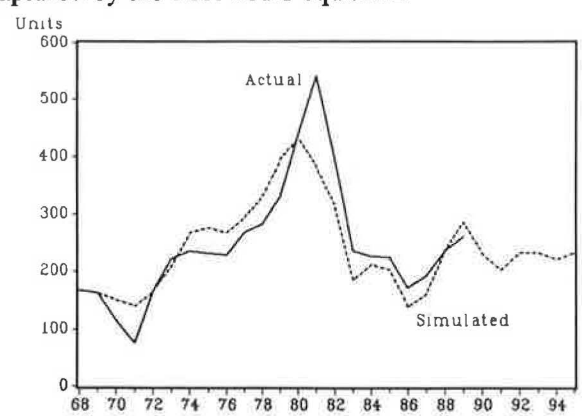

FIGURE 2 Simulated General Aviation New Jet Shipments

For the estimated jet forecasting model, the mean absolute percentage prediction error is 18 percent for jet shipments; 7 percent for jet fleet size, and 6 percent for jet fleet hours. The seemingly large mean prediction error for jet shipments reflects, in part, the inability of the model to detect completely the large decline in shipments in 1971 and the large increase in shipments in 1981. As such, the jet shipment equation performs better than this summary statistic suggests.

New jet shipments are projected to remain stable, around 230 units per year, over the forecast period. Fleet

TABLE 2 Actual and Simulated Values: General Aviation Turboprop Aircraft

Year	Units Shipped Actual	Units Shipped Forecast	Fleet Size Actual	Fleet Size Forecast	Fleet Hours Actual	Fleet Hours Forecast
1970	137	172	1458	984	970	888
1971	118	121	1492	1290	958	930
1972	239	207	1509	1284	1000	963
1973	305	245	1865	1530	1126	1058
1974	308	367	2120	1743	1247	1120
1975	335	423	2519	2074	1326	1213
1976	378	395	2486	2330	1327	1313
1977	449	468	2890	2667	1549	1437
1978	566	575	3130	3070	1606	1586
1979	659	707	3579	3583	1871	1753
1980	798	791	4090	4149	2240	1922
1981	898	666	4660	4602	2155	2069
1982	423	511	5186	4915	2186	2149
1983	292	206	5453	4968	2173	2184
1984	202	271	5809	5074	2506	2255
1985	217	269	5407	5176	2080	2306
1986	128	88	5964	5126	2881	2309
1987	125	12	5274	5013	2177	2297
1988	117	119	5259	4991	2370	2317
1989	123	209		5046		2359
1990		116		5022		2360
1991		22		4920		2344
1992		93		4879		2347
1993		84		4832		2348
1994		44		4753		2340
1995		70		4697		2339

Forecast values are truncated.

TABLE 3 Actual and Simulated Values: General Aviation Jet Aircraft

Year	Units Shipped Actual	Units Shipped Forecast	Fleet Size Actual	Fleet Size Forecast	Fleet Hours Actual	Fleet Hours Forecast
1970	115	149	950	894	474	440
1971	74	138	991	1120	481	574
1972	164	163	1123	1214	500	653
1973	221	207	1406	1429	703	752
1974	235	266	1579	1655	806	834
1975	231	275	1776	1903	874	914
1976	227	266	1938	2120	1000	992
1977	267	292	2277	2363	1165	1073
1978	282	329	2480	2631	1194	1161
1979	330	394	2653	2958	1259	1258
1980	438	432	2992	3309	1332	1355
1981	541	381	3171	3595	1387	1438
1982	395	314	3996	3799	1611	1490
1983	234	182	3898	3857	1473	1513
1984	225	210	4320	3942	1566	1551
1985	223	200	4375	4013	1622	1578
1986	169	137	4430	4015	1654	1585
1987	190	158	4338	4039	1528	1599
1988	234	233	4187	4141	1678	1636
1989	259	285		4292		1686
1990		229		4379		1713
1991		199		4432		1733
1992		232		4517		1761
1993		232		4598		1788
1994		219		4662		1811
1995		231		4737		1837

Forecast values are truncated.

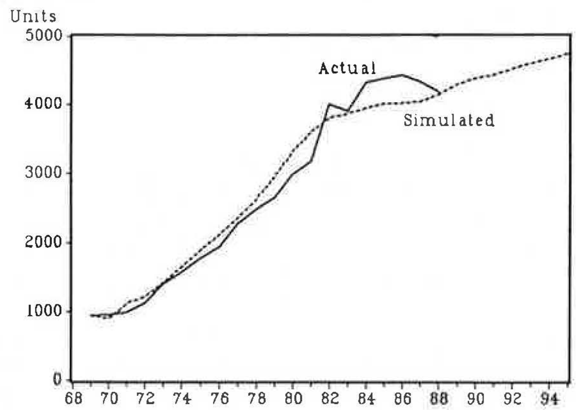

FIGURE 3 Simulated General Aviation Jet Fleet Size

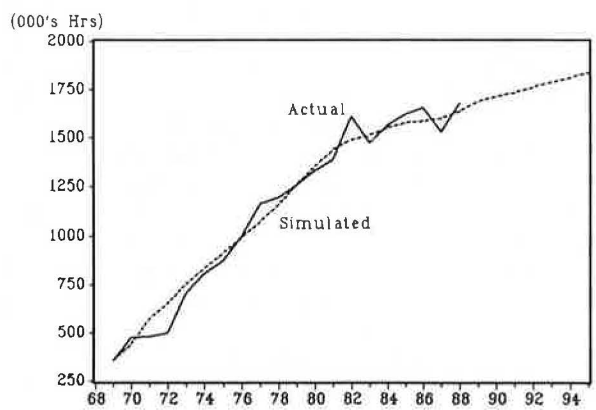

FIGURE 4 Simulated General Aviation Jet Fleet Hours

size is projected to increase to 4,737 jets. This corresponds to an average annual percentage increase of 1.7 percent, using the 1988 actual fleet size as the base. Commensurate with the growth in fleet size, annual jet fleet hours are projected to increase from approximately 1.6 million hours to 1.8 million hours. This corresponds to an average annual increase of 1.7 percent over the forecast period.

The simulations from the GA turboprop model (see Figures 5-7) are on par with those from the jet model. Simulated new turboprop shipments track with actual shipments over the sample period, although the turboprop shipment equation misses the record 1981 peak in new shipments. The model tends to underestimate turboprop fleet size; especially over the 1980-1988 period. Nonetheless, and despite the erratic movements in turboprop hours reported between 1982 and 1988, the model seems to do a reasonably decent job of describing the growth in fleet hours.

Over the sample period the mean absolute percentage prediction errors for the turboprop model are: 20 percent for new turboprop shipments; 10 percent for turboprop fleet size, and 6 percent for turboprop fleet hours. The rather large prediction error for new turboprop shipments reflects the extremely large percentage errors in 1987 and 1989; 90 percent and 70 percent, respectively.

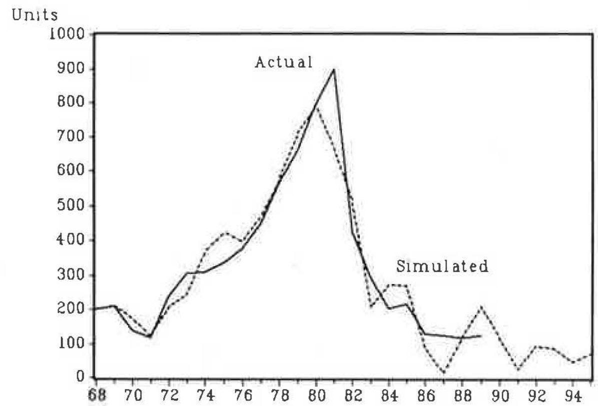

FIGURE 5 Simulated General Aviation New Turboprop Shipments

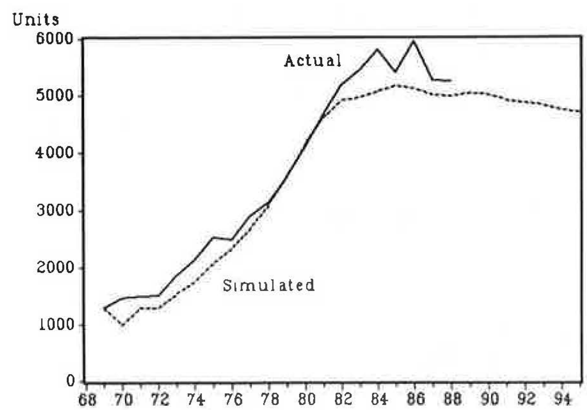

FIGURE 6 Simulated General Aviation Turboprop Fleet Size

Although there are oscillations generated by the new turboprop shipments equation, annual shipments appear to be stabilizing around 120 units, and there does not appear to be any growth trend in shipments over the forecast period. The turboprop fleet is forecasted to decline to approximately 4,700 units in 1995. This corresponds to an average annual negative growth rate of 1.6 percent, using the actually 1988 turboprop fleet size as the base. Despite the decline in fleet size, turboprop fleet hours are projected to remain relatively stable around 2.3 million hours. Apparently the positive effect of real GNP growth balances with the negative effect of the projected decline in fleet size.

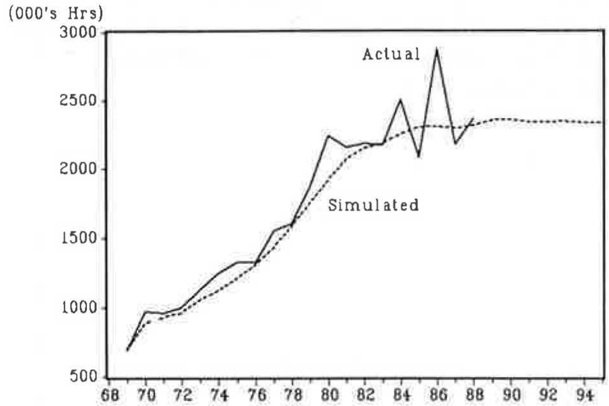

FIGURE 7 Simulated General Aviation Turboprop Fleet Hours

It appears that simple econometric models are able to explain historic movements in general aviation turboprop and jet activity. Two corollaries follow:

(1) Econometric techniques can provide relevant base-line forecasts over reasonably long forecast periods. This model generated predictions over seven years.

(2) Simple models do not generate large prediction errors, necessarily. Mean prediction errors from this exercise seem to fall within acceptable bounds. Nonetheless, econometric models can not capture all of the nuances of general aviation activity, and this is reflected in relatively large prediction errors in some, but few, years.

A DEMOGRAPHIC APPROACH TO GA FORECASTING

The large prediction errors in some years raises a question about alternative methods that might be useful in forecasting GA activity. The recent erratic movements reported in turboprop and jet fleet size and fleet hours also raises questions about the availability of alternative data that could be used to insure that forecast errors are not, in fact, errors in data.

Regina VanDuzee and David Rubin, both of COMSIS, have been involved in innovative work to develop an alternative forecasting methodology based on a bottom-up demographic analysis. They have constructed a data base with at least 11 years of data (1978-1988) gathered from federal sources:

- population of licensed pilots, by category
- registered aircraft, by category
- population
- employment
- personal income and disposable personal income
- hours flown by pilots, by age and medical certificate class
- operations, by category from towered airport data and Form 5010 data
- aircraft usage data from the GA activity and avionics survey

This data base is being used to test and evaluate alternative methods for forecasting FAA's general aviation activity measures: operations, flight plans filed, etc. They have adopted a dichotomy between compensated pilots and uncompensated pilots, as a surrogate to distinguish those flying high performance aircraft from those flying lower performance aircraft. Class 1 and 2 medical certificates are compensated pilots. Preliminary results portend success, and they will be trying a number of approaches to analyzing the data.

In addition to pilot medical certificate data, the COMSIS analysis is using survey data gathered from industry representatives, fixed base operators, managers of corporate aviation departments, and industry and pilot trade associations. Because the primary data are taken from medical certificates, their forecasts of GA activity will be categorized by medical classification (Class 1, 2, and 3) rather than aircraft type (piston, turboprop and jet). Additonal aggregation will show GA activity by compensated and non-compensated pilots.

Although specific forecasts from the COMSIS work will not be available until late 1990, it is useful to outline their approach since it will provide forecasts that can be compared with traditional econometric forecasts such as those presented above. Their work has additional interest because it makes use of flight activity data (pilot hours flown) available through the medical certification process.

The COMSIS approach is based on ratios describing the pilot population and flying characteristics by pilot subgroups. The ratios are used to build up a forecast of flight hours from the pilot base. The forecast of total flight hours can then be factored down to a forecast of fleet size and operations.

To gain an appreciation of the approach and the data used in the COMSIS method, refer to Figures 8-11. The forecast approach is a step-by-step process, enumerated below in simplified form.

Step 1: Forecast the pilot population. Figure 8 shows the ratio of pilots per capita. If this ratio is stable or the trend known, independent population projections from the census bureau can be used to predict the future pilot population. This can be done on a state, regional or national level.

Step 2: Forecast the pilot population by medical class. Figure 9 shows historic information on the number of pilots in each medical class. This information can be

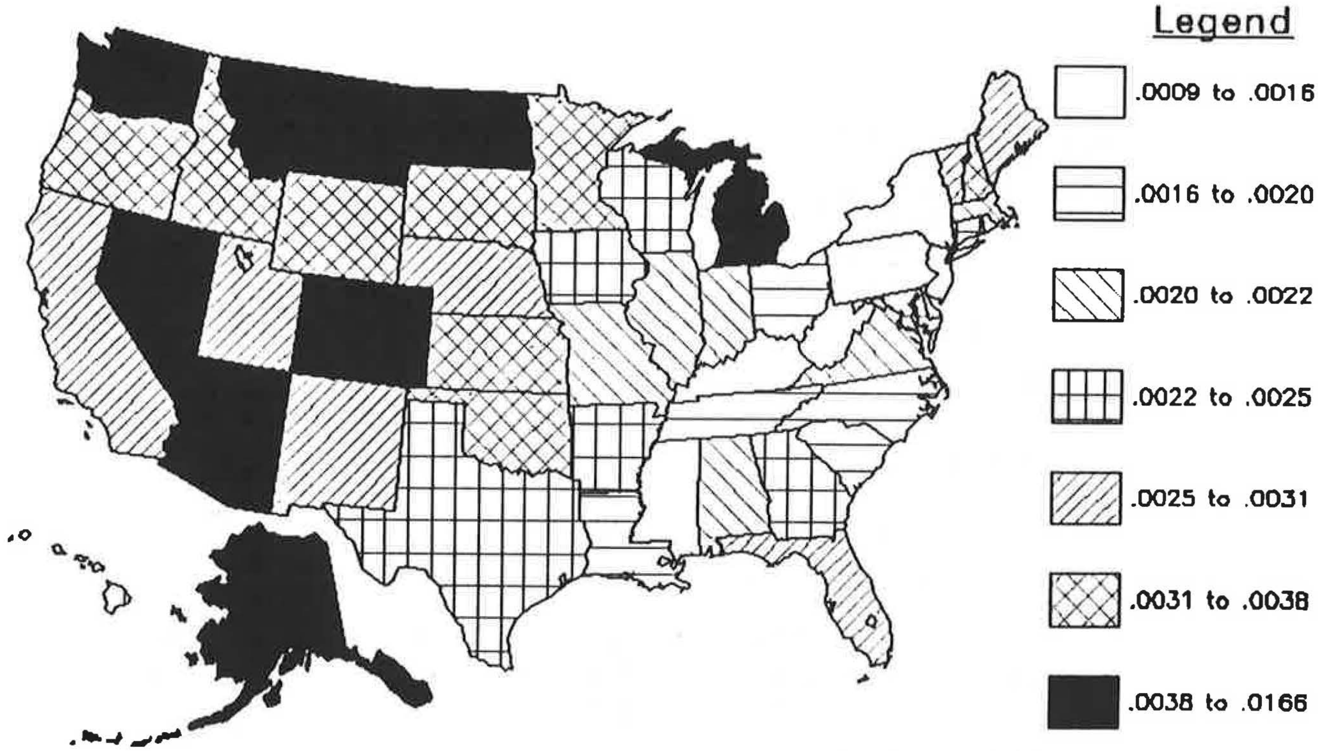

FIGURE 8 Percentage of Pilots in Population by State, 1988

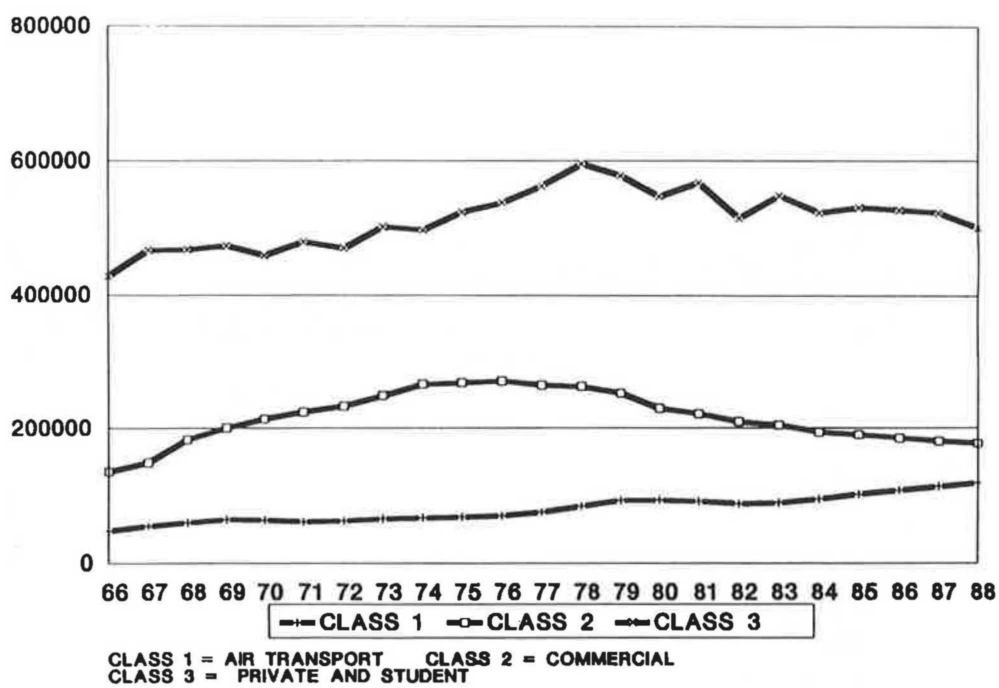

FIGURE 9 Number of Licensed Pilots by Class, 1966-1988

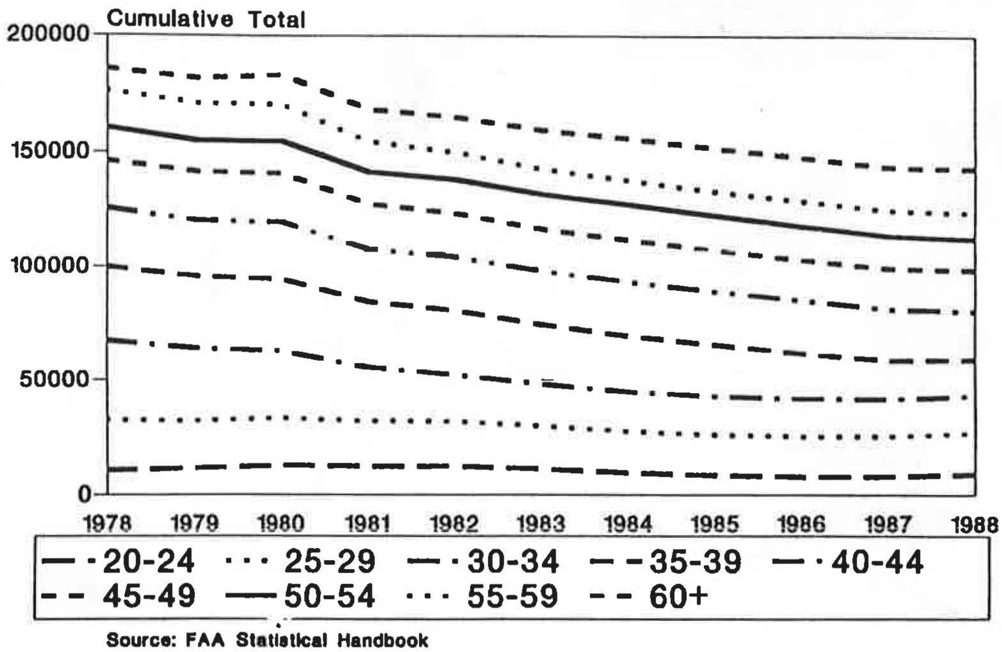

FIGURE 10 Commercial Pilots by Age, 1978-1988

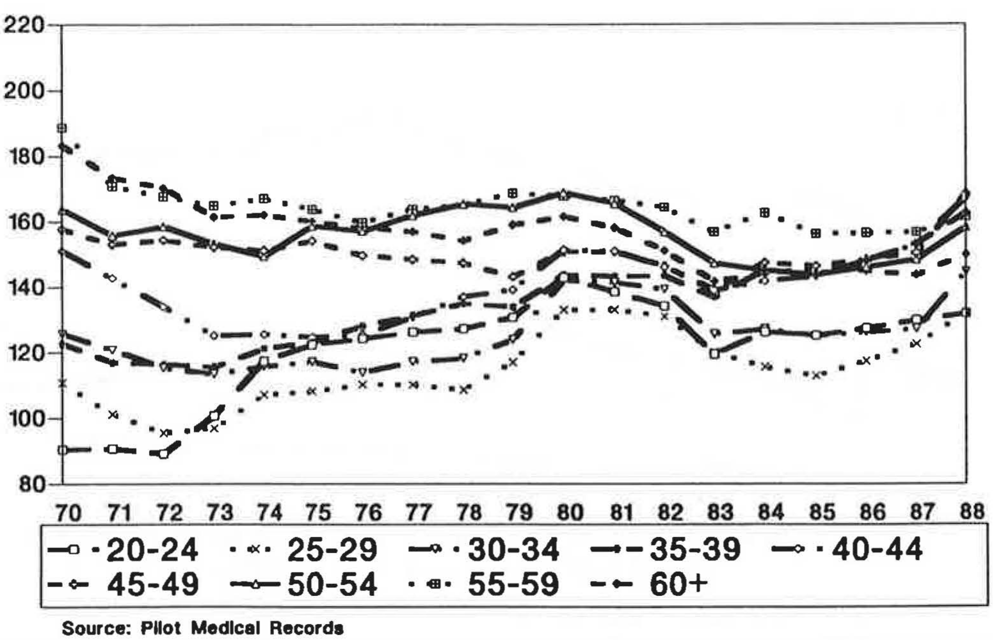

FIGURE 11 Hours Flown by Commercial Pilots by Age, 1970-1988

used to derive the proportion in each class. For discussion purposes consider Class 2, commercial pilots. The proportions or ratios by medical class can be used to decompose the forecasts over the pilot pool into forecasts over medical class.

Step 3: Forecast age profile of the pilot population by medical class. Figure 10 shows the age profile of Class 2 pilots. Extrapolating from historic data it is possible to decompose the medical class forecasts into age group forecasts within each class.

Step 4: Forecast hours flown by each age group, by medical class. Figure 11 shows historic information on hours flown for Class 2 pilots by age category. By extrapolation, similar information can be used to forecast hours flown for each forecasted age group in each medical class.

Step 5: Forecast total hours flown. Forecasts for total pilot hours can be constructed by aggregating over age groups and medical classes.

Step 6: Estimate fleet size. Use information on the average number of pilots per aircraft to develop a forecast of fleet size.

A critical assumption underlying this forecasting approach is that key ratios either display historic stability, allowing current values can be used directly in the calculations, or they display a strong discernible trend such that future values can be estimated with a high degree of confidence. This bottom-up demographic method can be applied to develop state or regional forecasts, as well as national forecasts since it is based on population projections. In fact, COMSIS is undertaking formal analysis to evaluate the usefulness of regional forecasts because of geographic differences important to GA flying behavior and patterns.

In conjunction with the demographic analysis COMSIS is investigating the use of delphi-like techniques to improve and refine GA forecasts. This approach has proven both useful and accurate in other applications by other agencies--most notably in forecasting passport activity. In the context of forecasting GA activity, a delphi-like approach may be useful in gauging the effect of factors difficult to quantify or changes that are unique or one-time occurrences. Specifically, through an extensive interview process, COMSIS is trying to flesh out factors affecting flying activity both by compensated and non-compensated pilots. A tentative list of factors is presented in Table 4. In the end, some of the factors identified through the interviews may be quantifiable. For others, it will be necessary to assign weights based on professional judgments and apply these weights to refine base-line forecasts.

TABLE 4 Factors Affecting Flying by Compensated and Non-Compensated Pilots

Hassle of flying in congested airspace
High price of new aircraft
Cost of liability insurance
Curfews and other airport restrictions
Hubbing
Expenditures on market development and promotion
Fleet management and chartering
Operating and maintenance costs
Reduced supply of new and used aircraft
Very little new technology
Cooperative promotional activities
Changing life styles
Cost of learning to fly
Strong interest in home-built aircraft
Employment opportunities for pilots
University aviation and aerospace programs

Source: COMSIS

It will be interesting to have the forecasts developed from this bottom-up demographic approach. Regardless of the forecast performance, the COMSIS work has introduced FAA and the GA industry to an interesting data set that can be used for a variety of purposes. For example, the medical certificate data suggest many important GA activity characteristics (eg., the number of pilots in the 50-54 age group, hours flown by pilots in the 45-49 age group) are stable, or stable around a clearly discernible trend. This point is taken up further in the section outlining data issues important to improving FAA forecasts of GA activity.

ISSUES AFFECTING LONG-TERM FORECASTS

Availability and access to airports has emerged as a major infrastructure issue and possibly constrains any future growth in general aviation activity. If one equates capacity with numbers, it would appear the nation has sufficient capacity to accommodate growth in GA activity. Nationwide there are about 5,600 public-use airports. Simple division into the GA fleet gives an allocation of approximately 40 GA aircraft to each airport (based on approximately 210,000 aircraft in the active fleet). Unfortunately, the geographic distribution of airport capacity does not match the distribution of GA activity. There are significant local and regional disparities. While the high plains states may have excess capacity, most areas in the Northeast region are losing GA airports through urban expansion. Increased land prices have made GA airports economically less attractive, and environmental concerns have prompted restrictive zoning laws and other regulatory constraints. Local governments are losing interest in owning and operating airports as the economics change and federal grants disappear. Ironically, the areas losing GA airports are those most likely to have increased demand for GA activity arising from rapid population growth and above-average economic growth. Although the surviving airports tend to be better equipped and financially stronger, localized bottlenecks are emerging as GA traffic is diverted to fewer local airports.

Product liability insurance costs still prevent recovery in the piston segment of GA activity. Despite some valiant and innovative entrepreneurial efforts to alter the economics of new piston production, most manufacturers are unwilling to place their companies at risk by aggressively reentering this market. At the same time, it now appears that the product liability issue has adversely affected flying behavior and the private pilot population. As part of their withdrawal from piston production, GA manufacturers have reduced their promotional expenditures which called attention to general aviation, created public interest in flying, and attracted individuals to their local airport or fixed based operator. Although this appears to be a rational short-run reaction to a declining market situation, the long-term, indirect effects, are only now appearing. There is reason to believe that the reduction in promotional activity both by the industry and FAA has lowered the perceived "price-value" relationship and contributed to the decline in the number of student and private pilots, as well as the decline in piston hours flown.

Although it is difficult to quantify the effects of a reduced number of GA airports and local air congestion on state, regional, and national forecasts of GA activity, any long-term forecast should be cognizant of localized GA congestion and the emerging mismatch between GA activity and the distribution of GA airports. Likewise, A forecaster or forecast user should be prepared to adjust forecasts if the product liability issue is resolved in favor of the GA industry.

DATA ISSUES AND IMPROVING GA FORECASTS

The workshop identified some important data issues that should be considered in efforts to improve the FAA forecasting process for GA. These issues include:

1. A continuing issue is the wedge between the registered owners of GA aircraft and the actual operators. It would be extremely helpful in tracking and forecasting GA activity to have information on operators so that more appropriate forecasting models might be developed. For example, from a study of the Federal Aircraft Registry, it would be easy to conclude that the banking and financial sector is a heavy user of general aviation aircraft and that statistical models should be built around this industry classification. Actually, in most instances the bank is a financing agent holding title. The level of use is determined by a second party (the operator) and not the "owning/registered" financial institution.

2. The General Aviation Activity and Avionics Survey is the most important and comprehensive source of GA information. For this reason, FAA should make every effort to protect the reliability of this data. It would be prudent to design the survey form so that it is less imposing to the respondent, and it might be worthwhile to implement a stratified sampling strategy so that sample biases are minimized. Econometric models seem to be able to track the FAA data, but it is becoming less clear if the survey results accurately reflect general aviation activity overall.

3. Access to flight plan data would be helpful in tracking GA activity and in trying to anticipate turning points. Trends are easy to forecast, but turning points are more important. At one time FAA made available data from a "two-percent sample." Perhaps it would be possible to routinely (monthly) report information from a sample of general aviation IFR flight plans. Although this is only one segment of GA activity, it is likely to be a very important segment, both to FAA in tracking flight activity and to the industry.

4. Given the increasing importance of international trade flows, it would helpful to have information on GA imports and exports of new and used aircraft by type (piston, turboprop and jet). A comparison of changes in fleet size with new aircraft shipments is convincing that the international flow of GA aircraft is significant and affects FAA workloads through changes in fleet size and fleet hours.

5. Current reporting of GA activity includes commuter activity. This distorts some of the aggregate measures since commuter characteristics are much different from those of the other general aviation categories. In some cases it is possible to adjust the data for commuters, but this should be done routinely in FAA reports. It would be helpful to have summary statistics excluding commuter activity reported.

6. It would be beneficial, both for forecasting purposes and in understanding GA development, to have published information by flight-hour groups. Partial information is available through the General Aviation Activity and Avionics Survey, but it would more useful if more comprehensive summary measures were compiled from the survey and reported regularly.

7. It would be helpful if FAA reduced the time lag in publishing summary data from the General Aviation Activity and Avionics Survey.

8. Forecasts should be internally consistent. The medical certificate data suggest that many ratios exhibit stability over time, including (a) pilots/airplane, (b) GA hours/pilot, and (c) hours/plane. FAA could check the internal consistency of its forecasts by computing these or similar ratios for the forecast period.

9. In some cases states are doing an excellent job in tracking general aviation activity, including registrations and airport operations. Given the gaps in the Federal Aircraft Registry, FAA may wish to inventory various states known for their GA tracking systems and, where appropriate, take advantage of state-collected data. It may be possible to extrapolate from state data to derive national estimates.

10. It would be useful to reinstitute a periodic survey of Fixed Base Operators (FBOs) to gather additional information on GA activity. FBOs may be a very good source of information concerning changes in flying patterns, the mix of general aviation activity, and GA uses. An FBO survey could be undertaken biennially.

Data are never perfect, and forecast errors are inevitable. Nonetheless, participants in the TRB Workshop spoke optimistically about the possibility of improving FAA forecasts of GA activity. Simple econometric models are capable of describing historic patterns in GA activity, and it reasonable to believe they can generate base line-forecasts of future GA activity. The base-line forecasts should be adjusted, when necessary, using professional judgments and additional information available through state agencies, supplemental surveys, workshops, and industry forums. Alternative forecast methods are being developed, and these can diversify the FAA forecaster's tool kit and add a "checks-and-balances" system to the forecasting process. FAA personnel are experienced in data collection and recognize the strengths and weakness of their survey results and estimates of GA activity. A variety of suggestions to improve data collection and reporting were offered. With appropriate support, encouragement, and cooperation, it will be possible to devise improved forecasting methods which can be applied to improved data sets to insure better GA forecasts.

As a closing observation, the role of GA as part of the Nation's transportation system should be reexamined. The need for transportation services is a function of GNP. If the GA fleet capability and flight activity does not increase as fast as GNP, GA will lose market share in the transportation system. In fact, the current "flat" fleet size in the context of modest real economic growth and increased intercity travel implies GA is losing market share. Something has changed in the "price-value" relationship in general aviation. This, in turn, suggests the need to explore the factors contributing to the change in the price-value relation (such as reductions in promotion expenditures, elimination of the investment tax credit, and the product liability tax) throughout the GA chain from component manufacturers to local fixed base operators.