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# Proceedings of the Transportation Research Forum

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Four recent deep draft studies are reviewed to assess the adequacy of their analyses with the requirements of the P&G. The studies' implementation of each of the nine P&G steps is reviewed in terms of a practical minimum and probable maximum level of effort relative to the overall guidelines. The studies appear to meet the minimum thrust of the P&G requirements subject to the assumption of large captive hinterlands which negated the execution of certain P&G study steps. Too little analysis appears to have been done on user perceptions and needs. The four studies reviewed should not be regarded as suitable models for other port analyses that cannot presume the existence of large captive hinterlands.

The paper presents the most common problems associated with the clarity and application of the P&G to deep draft projects. Recommendations are made to clarify P&G applications in seven areas: (1) Base Case Conditions; (2) Fleet Analysis and Forecasts; (3) Commodity Analysis; (4) Multiport Alter-

natives; (5) With and Without Project Conditions; (6) Calculate Benefits and Costs; and (7) Conclusions/Finalization.

Substantial improvements are possible in future harbor studies and articulation of the practical problems implementing the P&G. A clearer conceptual framework, reflecting revisions of the P&G, will not necessarily make harbor improvement studies more objective given the wide range of interacting variables and practical problems suggested but not fully articulated by the P&G. Closer adherence to the P&G is required in future studies. The P&G need to be supplemented by clear articulation of the problems and tradeoffs that routinely characterize deep draft navigation benefit evaluation procedures. The P&G lead the planning analyst through the conceptual steps to evaluate deep draft navigation improvements, however, no guidance is provided to address significant practical problems, tradeoffs and interrelationships among the study steps.

### Session 3-D: General Aviation Issues

*Session chair: Scott Ornstein, Reebie Associates,  
Transportation Management Consultants,  
Greenwich, Connecticut*

#### Summary By Session Chair: General Aviation Issues

The first paper presented during this session, "Aviation Safety: The Experience of General Aviation" by Clinton V. Oster, Jr. and C. Kurt Zorn examined the causes of general aviation accidents which occurred in the United States between 1983 and 1986. The authors concluded that while general aviation flights compose the majority of aircraft hours flown in this country, (the other sectors being scheduled domestic jet services, scheduled commuter services and On-Demand Air Taxi services), general aviation accounts for an even higher percentage of aviation facilities. The authors also determined that pilot error was the primary cause of general aviation accidents, followed by equipment failure. They therefore suggest that general aviation maintenance practices and FAA inspection procedures be re-evaluated and improved as necessary.

The second paper presented at this session was "A Method for Identifying General Aviation Airports that are Candidates for Runway Extensions: A Planning Model for State Aviation Systems", which was co-authored by Randall G. Holcombe and Henry B. Burdg. The authors state that an extremely important characteristic of an airport is the length of its longest runway, which determines the type of aircraft that can safely operate at that airport. Extending a runway can increase the utility of an airport, but scarce financial resources dictate that such decisions be made carefully. The authors thus developed a linear regression model to compare airports, resulting in a way that state officials can evaluate proposals for runway extensions.

The authors determined that there are two categories of factors (demographic and airport related) to consider when evaluating such proposals. The authors considered ten demographic factors such as population in the

immediate vicinity of the airport and population density; and also examined 23 airport factors such as the number of based aircraft, and the location of other airports. Using their model with data from Alabama, the authors concluded that 22 of the 106 public use airports in that state had runways substantially shorter than their other characteristics predicted.

### **Aviation Safety: The Experience of General Aviation, by Clinton V. Oster, Jr. and C. Kurt Zorn.**

**Clinton V. Oster is Professor and Associate Dean, School of Public & Environmental Affairs, Indiana University, Bloomington, Indiana.**

**C. Kurt Zorn is also with the Indiana University, Bloomington, Indiana.**

General aviation is an important segment of the aviation industry encompassing more than 700,000 pilots who fly over 30,000,000 hours annually in over 200,000 aircraft. General aviation also experienced well over 13,000 fatalities between 1975 and 1985, an average of over 11 people killed for each person killed in an accident by a U.S. scheduled jet carrier. Not surprisingly, general aviation is perceived as less safe than either jet carriers or commuters, yet far less attention has been paid to general aviation safety than to scheduled carrier safety.

This paper examined safety in general aviation by analyzing the causes of over 9,000 general aviation accidents that occurred in the United States between 1983 and 1986 using data collected by the National Transportation Safety Board. Records of individual accidents were examined to determine the initial cause of the accidents. General aviation safety was then compared with other segments of the aviation industry.

Pilot error was found to be the primary cause of general aviation accidents and accounted for a much larger share of accidents than in any other segment of civil aviation. Deficient flying skills were not the principal form of pilot error leading to accidents. Instead both errors in in-flight judg-

ment and procedures and in pre-flight judgment and procedures were far more important types of pilot error leading to accidents and particularly to fatal accidents. Perhaps surprisingly, student pilots actually had a lower accident rate than more experienced general aviation pilots. Equipment failure was the second leading cause of general aviation accidents with engine failure the principal type of equipment failure.

### **A Method For Identifying General Aviation Airports That Are Candidates for Runway Extensions: A Planning Model for State Aviation Systems, by Randall G. Holcombe and Henry B. Burdg.**

**Randall G. Holcombe is with the Florida State University.**

**Henry B. Burdg is Director, ATAC/Auburn University, Alabama.**

One of the most important characteristics of an airport is the length of its longest runway: that footage determines the types of aircraft that can use the airport and provides a margin of safety for users. A runway extension, therefore, would enhance the utility of many airports. But resources are scarce, and if funds are to be allocated at the state level, state officials need a method for determining which airports could best use a longer runway. This paper describes a model that uses regression analysis to compare airports in Alabama, taking into account a number of different factors. With the results from this model, state officials can evaluate proposals for runway extensions.

Factors determining the appropriate runway length can be divided into two general categories: demographic factors and airport related factors. Ten demographic factors were considered, such as the population of the county where the airport is located, population in the immediate vicinity of the airport, population growth in the area, population density, number of businesses, employees, and payroll. Also considered were 23 airport factors, including the number of based aircraft, and operations at the airport,

services offered, and the location of other airports. A linear regression model was used to evaluate how an airport's runway length compared to others around the state with similar characteristics. Using runway length as the dependent variable, several regression equations were estimated with different sets of independent variables. One regression used all 32 independent variables; others used only demographic factors, airport data, or the number of operations at the airport. The residuals from the regressions were used to identify those airports with relatively short runways, considering their other characteristics. The regression analysis identified

22 of the 106 public-use airports in Alabama as having runways substantially shorter than their other characteristics would predict.

Conclusions and recommendations for airport development organizations are presented to identify runways for possible extensions. The methodology is also presented to allow aviation planners to duplicate the analysis with data specific to their domain. The results can be used to proactively identify airport development opportunities that can be further evaluated using the traditional benefit-cost analysis techniques.

### Session 3-E: Forward Pricing in Transportation

*Panel chair: Dan Zink, Upper Great Plains Transportation Institute*

**Panelists:**

**Richard Carter, Vice President of Agricultural Commodities, Burlington Northern Railroad.**

**Ron Olson, Vice President Midwest Region, Continental Grain Company.**

**Ken Casavant, Professor of Agricultural Economics, Washington State University.**

**Bill Wilson, Associate Professor of Agricultural Economics, North Dakota State University.**

**Richard Carter**

The Burlington Northern's forward pricing program, the Certificate of Transportation, is based on proven economic models that have been applied and worked well in other facets of the grain industry. Forward contract markets in grain began over 100 years ago, and have several critical success features

associated with them. These include guarantees of supply and price for participants, a public information system where price and demand are discovered, market liquidity, and efficient resource allocation.

BN's COT program is based on four principles: (1) market-based pricing, (2) compatibility with the commodity marketing infrastructure, (3) driven by price and service, and (4) profitability. COT service is available for up to 40% of BN's monthly capacity and is offered for 14 standardized origin/destination-specific corridors. COTs are offered for sale for a 15 day shipment period, up to 6 months forward. Buyers may bid for certificates daily, with minimum bids established above or below existing tariff rates. COTs are offered and awarded to highest bidders via electronic media. Buyers place actual car order 5 days prior to the applicable 15 day shipment period; BN guarantees car placement within that period or pays penalties. The certificate is negotiable and may be traded at any time between its purchase and the actual shipment period. The holder of the COT may switch corridors for a fee, and can elect to default and not use the certificate, but loses the 25% advance payment required at purchase. As of October 9, 1989, over 16,000 bids were received for COTs, with 11,457 actually sold. This represents

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