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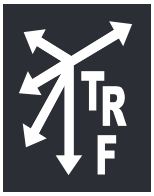

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A Strategic Variance Analysis of the Profitability of U.S. Network Air Carriers

by Paul Caster and Carl A. Scheraga

Airlines, as part of their strategic planning process, articulate positions with regard to cost leadership, product differentiation, and growth. Decisions implemented are dynamic and inter-temporal in nature. Therefore, it is often difficult to assess the effectiveness of changes in strategies, particularly since such effectiveness is often a function of the confounding forces of organizational strategy and market conditions. Managers thus need a multi-period methodology to evaluate the implementation of strategic positions. One such approach is the strategic variance analysis of operating income.

Horngren et al. (2000, 2006, 2012) demonstrate a methodological template for decomposing operating income into three components: (1) growth, (2) price recovery, and (3) productivity. It is suggested that the price recovery component assesses a firm's product differentiation strategy and that the productivity component assesses a firm's low-cost strategy. Thus, this framework is very much in the spirit of Porter's (1980) seminal work.

This study examines U.S. network airlines in the post-9/11 environment. Utilizing the above methodology, it first identifies comparative strategic positions across airlines and then assesses the implementation efficacy of these positions.

INTRODUCTION

The decade from 2000-2010 was a tumultuous one for the U.S. airlines industry. This has been particularly so for network carriers (as classified by the U.S. Department of Transportation) Alaska, American, Continental, Delta, Northwest, United, and US Airways. Since the upheaval of 9/11, United, Delta, US Airways (twice), and Northwest have all filed for bankruptcy. American and Continental reorganized outside of bankruptcy. Not including regional affiliates, these airlines account for a 58% share of the U.S. market (Herbst 2009).

In comparing 2008 with 2000, Herbst (2009) details some dramatic statistics for the so-called legacy carriers—American, Continental, Delta, Northwest, United, and US Airways.[1] Total operating revenue decreased by $2.3 billion, falling from $89.2 billion to $86.9 billion. Fuel cost went from $11.3 billion to $36 billion (an increase of 218%). More specifically, the fuel cost for the average one-way passenger fare increased by 304%, going from $23 to $93. Capacity as measured by available seat miles (ASMs) decreased by 14.3%. At the same time, employee wage/salary expense decreased by 33.5%. The average one-way passenger fare increased by 22%, going from $162 to $198. While the average air fare increased by $36, the labor wage cost for the average air fare decreased by 36% to $41. Since 9/11, over 155,000 jobs for just the legacy carriers have been lost, falling from 428,000 to 272,000 (a decrease of 36%) total employees. The average passenger ratio to airline employee increased from 1,139 passengers per employee to 1,413. As employees worked more for less, the average revenue generated per employee increased by 53%, going from $209,000 per employee to over $319,000.

Data from the Security and Exchange Commission (10K Reports) and the Bureau of Transportation Statistics show a similar pattern for Alaska Airlines for this time period. While operating revenues increased 83%, operating income declined by 82%. Average fuel cost increased by 232%, although available seat miles increased by 25%. The average passenger fare increased by 34%. From 2002 to 2008, the average number of passengers per employee increased from 1,396 to

1,746, the average revenue per employee increased by 63%, the number of employees decreased by 5%, and wages and benefits as a percentage of operating income decreased by 5.9%.

This study utilizes strategic variance analysis to investigate how changes in network airlines' strategies, in the post-9/11 environment, have impacted operating income. The analysis will not only allow for the examination of the impact of a carrier's strategic actions with regard to managing growth, price-recovery, productivity, and capacity, but will also allow for a benchmarking of the efficacy of a carrier's strategies against those of its rivals. As noted below, this kind of analysis is particularly useful in a dynamic environment such as that faced by the network carriers, where strategic actions by rivals are simultaneous and interactive (Mudde and Sopariwala 2008b).

Several recent articles have applied strategic variance analysis to analyze a given airline's profitability (Mudde and Sopariwala 2008a and Bailey et al. 2009) or to examine a given airline's cost structure (Dikolli and Sedatole 2004). However, none of these articles provides a comprehensive and strategic analysis of airline profitability by comparing each carrier to similar airlines in their sector of the industry, nor has any study been conducted over an extended period of time.

STRATEGIC VARIANCE ANALYSIS

In his seminal work, Michael Porter (1980) developed the paradigm of three generic strategies for creating a competitive advantage. A firm pursuing a position of cost leadership will emphasize efficiency in order to lower costs, thus being able to under-price competitors. The focus of such a strategy is one of low margins and high volume. A firm with a strategic orientation toward differentiation seeks to produce a product or service that embodies distinctive qualities for which customers are willing to pay a premium price. The third strategy is a niche-seeking one. This strategy seeks to identify a small part of the market not served by direct competitors of the firm. The firm is able to charge a premium price for a high quality product desired by this small market segment, that is, volume of sales will be low but margins high.

Banker and Johnston (2002) argue that in increasingly dynamic business environments, in the context of Porter's strategy framework, "it has become increasingly important for managers to develop coherent, internally and logically consistent business strategies and to have tools and models which provide useful information to support strategic decision-making, planning and control." One development, in response to this strategic mandate, has been the emergence of strategic variance analysis (SVA). Shank and Churchill (1977) note that variance analysis is the term applied to the process of specifying the reasons as to why actual operating income, for a given period, is different from the expected or planned level of operating income. Operating income is decomposed into components (and their associated measures) that logically relate to a firm's business strategy as described by Porter above. The variances are differences in the component measures of budgeted versus actual operating income.

Specifically, Shank, and Govindarajan (1993) decompose variances in operating revenues into mutually exclusive sub-variances in order to separate out the impacts of key underlying causal factors. They define the notion of corporate mission in terms of profitability and the orientation/ perspective of build, hold, or harvest. They further define the notion of strategy in terms of Porter's low cost leadership and product differentiation. They then argue that by analyzing the sub-variances with reference to a firm's mission and strategy, one can determine the extent to which variances between actual and budgeted performance are consistent, or not consistent, with the above mission and strategy. Furthermore, these variances can suggest the dimensions of performance that need improvement. The framework of Horngren et al. (2012) provides the specification of the components of operating revenues utilized in this study.

THE FRAMEWORK OF THIS STUDY

Horngren et al. (2000, 2006, 2012) provide a framework for analyzing a manufacturer's change in operating income from one period to *any* future period by decomposing company performance into cost leadership, product differentiation, and growth components. Sopariwala (2003) extends the SVA model in Horngren et al. (2000) to include underutilization of capacity as a fourth factor in the analysis. Capacity utilization is an important consideration, particularly in the airline industry, where carriers make strategic decisions about grounding existing airplanes or purchasing new airplanes and expanding their fleets. Mudde and Sopariwala (2008b) adapt the Horngren et al. (2000) framework to include factors unique to the airline industry. They also choose cost drivers, such as RPMs and ASMs, that are more suitable to airlines as compared with those that would be used by manufacturers. The individual components described in Mudde and Sopariwala (2008b) are as follows:

Growth Components

The growth component for an airline measures the change in operating income caused by variations in revenue-passenger miles (RPMs) (holding sales prices, input costs, and input-output relationships constant) that are due to either changes in market share or in market size.

Price-Recovery Component

The price-recovery component measures the change in operating income caused by variations in sales prices and unit input costs (holding sales units, for example RPMs or ASMs, and input-output relationships constant). Horngren et al. (2012) suggest that the price-recovery component assesses a firm's *product differentiation strategy*. A positive value for this component implies that the firm's product differentiation strategy provided sufficient pricing power to the firm so that its customers were induced to reimburse the firm by an amount greater than the increase in costs experienced by the firm.

Productivity Component

The productivity component measures the change in operating income caused by variations in input-output relationships (holding RPMs, sales prices, and unit input costs constant). Horngren et al. (2012) suggest that this component assesses a firm's *low-cost strategy*. A positive value for this component implies that operating income increased because of gains in the firm's efficiency.

Capacity Underutilization Component

The capacity underutilization component measures the change in operating income caused by a variation in the cost of unused capacity over the time period being considered. Sopariwala (2003) suggests that this component assesses a firm's ability to manage the critical tradeoff between used and unused capacity.

The empirical specifications of each of these components are provided in the appendix. The specifications utilized are those provided in Mudde and Sopariwala (2008b), who show the variances were normalized by dividing by revenue-passenger miles in billions.

PURVIEW OF THIS STUDY

Mudde and Sopariwala (2008b) performed an SVA on Southwest Airlines for the year 2005 relative to 2004. They showed that the $266.5 million increase in operating income in 2005 was primarily the result of Southwest's productivity gains during the period. Southwest has a reputation in the industry as a cost leader, and during the period, they reduced fuel usage costs, decreased costs due to increases in passenger load factor, and decreased costs due to increases in miles flown per passenger, all consistent with their strategy as a low cost leader.

Mudde and Sopariwala (2008a) used this SVA of Southwest Airlines for the year 2005 as a benchmark for United Airlines for the same year. Their analysis illustrated that an SVA of a single company, taken by itself, may produce misleading results. For example, when examining the growth component, United Airlines appeared to be doing better in 2005 due to an increase in the size of the market. But that increase was negligible when compared with Southwest. However, it is not obvious that Southwest Airlines is an appropriate benchmark for United Airlines (see Tsoukalas et al. 2008). In an unpublished working paper, Mudde and Sopariwala (2010) use industry averages taken from the U.S. Department of Transportation, Bureau of Transportation Statistics to benchmark the performance of American Airlines for the year 2009. We believe this may be an improvement over benchmarking against a single competitor. However, we question the choice of the entire U.S. airline industry as an appropriate benchmark. We suggest that, for the present study, a composite based on using just the U.S. network airlines would make a more appropriate benchmark.

TIMEFRAME OF THIS STUDY AND ASSOCIATED DATA SET

The data needed to calculate the variances for SVA are collected from the International Civil Aviation Organization, *Financial Data: Commercial Air Carriers, Series F* and *Traffic: Commercial Air Carriers, Series T*, as well as the U.S. Department of Transportation, Bureau of Transportation Statistics, *TranStats Aviation Database* for the relevant years.

We examine two, three-year time periods: 2004 to 2006 and 2007 to 2009. A three-year window is utilized because of the need to allow time for changes in strategic choices to impact logistical, technological, and capacity configurations that impact operational efficiency. Precedence for measuring the impact of such strategic choices from one end point of a multi-year period to the other can be found in Greer (2006) and Scheraga (2011). We chose 2004 as the starting point of the analysis because the airline industry was severely disrupted in the aftermath of 9/11 and the industry did not return to pre-9/11 levels until July 2004 (Bureau of Transportation Statistics 2005).

The analysis for the time period 2004-2006 included all seven of the network airlines—Alaska, American, Continental, Delta, Northwest, United, and US Airways. However, US Airways was not included in the latter time period. US Airways and America West merged in September of 2005 (although actual integration was not implemented until 2007), with unconsolidated financial and operating data for these two airlines not being available after 2007. For purposes of benchmarking, we constructed a composite in each time period from all the airlines being examined in that particular time period.

The data set includes both U.S. and international flights of each airline. The data set excludes flights of regional airlines that may have partnerships with network airlines. Regional airlines have a different profile and would not be comparable to network airlines.

RESULTS OF THE STRATEGIC VARIANCE ANALYSIS

First we illustrate the calculation of SVA using data for Delta Airlines. As shown in Table 1, Delta Airlines had a $1.157 billion operating loss in 2003, but three full years later, by the end of 2006, it recorded a $30.84 million operating profit. Thus, for the three-year period ending in 2006, operating profitability increased by $1.188 billion. In 2009, Delta was back in the red with a $604.8 million

operating loss. Thus, for the three-year period ending in 2009, operating profits decreased by $635.6 million. Examining individual lines in the income statements is not very meaningful to gauge what happened during these two, three-year periods, or which aspects of Delta's strategies were more or less successful.

Table 1: Example: Delta Airlines – Financial Data ($)

	2003	2006	2009
Operating Revenues	14,203,030,000	17,339,136,000	18,046,578,000
Operating Expenses	15,360,195,000	17,308,296,000	18,651,424,000
Flying Operations	4,328,788,000	5,642,667,000	6,130,117,000
Maintenance	1,168,779,000	1,133,176,000	1,294,256,000
Depreciation and amortization	1,099,559,000	1,194,253,000	961,664,000
User charges	302,370,000	319,343,000	413,798,000
Station expenses	2,103,243,000	1,786,841,000	1,815,537,000
Aircraft and traffic servicing	2,405,613,000	2,106,184,000	2,229,335,000
Passenger services	1,416,162,000	1,114,511,000	1,313,133,000
Promotion and sales	1,219,397,000	1,190,751,000	1,174,798,000
General & Administrative	953,176,000	925,343,000	1,112,997,000
Transport related expenses	2,768,721,000	4,001,411,000	4,435,124,000
Operating profit	-1,157,165,000	30,840,000	-604,846,000

Data Source: International Civil Aviation Organization, *Financial Data: Commercial Air Carriers Series F*, Montreal, Quebec, Canada, 2003, 2006, and 2009

Table 2 provides the operational data for Delta Airlines needed to perform the SVA, and Table 3 provides the fuel data. Table 4 reclassifies the financial data into the categories used by Mudde and Sopariwala (2008a, 2008b), namely fuel costs, flight-related costs, and passenger-related costs. Flight-related costs include flying operations less fuel costs, plus maintenance, passenger service, general and administrative costs, depreciation and amortization, and transport-related costs. Passenger-related costs include aircraft and traffic servicing expenses and promotion and sales-related expenses. Finally, Table 5 calculates the data used to perform the SVA based on the reclassified financial data in Table 4 combined with the operational data in Table 2 and the fuel data in Table 3. Finally, variances are calculated using the formulas in Appendix A and the data are normalized based on revenue-passenger-miles (RPMs) in billions. This results in the SVA presented in Tables 6a and 6b, in addition to the other network air carriers in this study.

Table 2: Example: Delta Airlines – Operational Data

	2003	2006	2009
Revenue passenger enplanements	84,076,432	73,524,956	67,744,784
Revenue passenger miles	89,135,332,782	98,748,194,606	100,582,412,275
Available seat miles	119,886,312,311	125,073,038,393	122,149,414,544

Data Source: International Civil Aviation Organization, *Traffic: Commercial Air Carriers, Series T*, Montreal, Quebec, Canada, 2003, 2006, and 2009

Table 3: Example: Delta Airlines – Fuel Data

	2003	2006	2009
Total gallons used	2,009,322,668	1,932,690,482	1,934,723,833
Total fuel costs	1,594,053,782	4,069,259,987	4,663,250,851
Average fuel cost per gallon ($)	0.79	2.11	2.41

Data Source: U. S. Department of Transportation, Research and Innovative Administration, Bureau of Transportation Statistics, *TranStats Database*, Washington, D. C., 2003, 2006, and 2009

Table 4: Example: Delta Airlines – Reclassified Financial Data ($)

	2003	2006	2009
Total operating revenues	14,203,030,000	17,339,136,000	18,046,578,000
Less: Total operating expenses	15,360,195,000	17,308,296,000	18,651,424,000
Fuel costs	1,594,053,782	4,069,259,987	4,663,250,851
Flight-related costs	10,141,131,218	9,942,101,013	10,584,040,149
Passenger-related costs	3,625,010,000	3,296,935,000	3,404,133,000
Operating income/(loss)	-1,157,165,000	30,840,000	-6,0484,6000

	2003	2006	2009
Flying operations	4,328,788,000	5,642,667,000	6,130,117,000
Less: Fuel cost	1,594,053,782	4,069,259,987	4,663,250,851
Flying operations (excluding fuel cost)	2,734,734,218	1,573,407,013	1,466,866,149
Maintenance	1,168,779,000	1,133,176,000	1,294,256,000
Passenger service	1,416,162,000	1,114,511,000	1,313,133,000
General and administrative	953,176,000	925,343,000	1,112,997,000
Depreciation and amortization	1,099,559,000	1,194,253,000	96,1664,000
Transport related	2,768,721,000	4,001,411,000	4,435,124,000
Total flight-related costs	10,141,131,218	9,942,101,013	10,584,040,149

	2003	2006	2009
Aircraft and traffic servicing	2,405,613,000	2,106,184,000	2,229,335,000
Promotion and sales	1,219,397,000	1,190,751,000	1,174,798,000
Total passenger-related costs	3,625,010,000	3,296,935,000	3,404,133,000

Data Sources: 1) Data Source: International Civil Aviation Organization, *Financial Data: Commercial Air Carriers, Series F*, Montreal, Quebec, Canada, 2003, 2006, and 2009 and 2) U. S. Department of Transportation, Research and Innovative Administration, Bureau of Transportation Statistics, *TranStats Database*, Washington, D. C., 2003, 2006, and 2009.

The SVA of Delta clearly shows how Delta achieved profitability by the end of 2006. During the three-year period, productivity improvements resulted in almost $1.5 billion in increased operating profits. Cost cutting occurred across the board, but particularly in passenger-related activities. Delta's annual reports filed with the Securities and Exchange Commission (SEC) reveal some specific examples of cost-cutting measures taken. Delta eliminated approximately 6,000 non-pilot jobs, reduced pay and benefits for non-pilot employees, and simplified the fleet by retiring four different fleet types. Additionally, it redesigned hubs in Atlanta and elsewhere to improve reliability and thereby reduce costs (SEC 2004, 2005).

The price-recovery component indicates an almost $1 billion decrease in profitability. The analysis indicates that increases in Delta's airfares were not sufficient to cover increased fuel costs during the period. Management of capacity resulted in approximately $510 million in increased profitability for the three-year period. The Delta Annual Report indicated that existing capacity was shifted in part from certain underperforming domestic flights to more profitable international flights (SEC 2006). The growth component indicates a modest $154 million improvement.

For the three years ending in 2009, the SVA of Delta shows a similar pattern to the earlier period, except that productivity gains were far smaller and not nearly sufficient to cover tremendous losses in the price-recovery component. The price-recovery component shows a loss of over $1.3 billion. The small increase in airfares was overwhelmed by large increases in fuel costs, flight-related costs, and passenger-related costs, holding all else equal. Productivity gains were more modest than in the prior three-year period. Delta achieved savings of $359 million in passenger-related costs and almost $200 million in fuel used per available seat mile. Capacity management contributed $222.3 million in profitability and the growth component shows an increase of $39.3 million. Nonetheless, the large loss in the price-recovery component resulted in an overall decrease in profitability of $635.7 million for the three years.

The SVA for Delta is insightful and interesting, but it is an incomplete analysis without taking into consideration what was happening with its closest competitors. For this reason, we conduct a relative SVA by ranking each of the network carriers on the four components of SVA. Table 7a shows the rankings for the three-year period ending in 2006, after normalizing the data using RPMs in billions. The domestic airline business finally reached pre-9/11 levels in July 2004, and continued to grow during this period. Thus, six of the seven network airlines saw positive contributions to operating income based on growth of the business, but Continental and Alaska led the way by far, while Northwest and United were laggards. US Airways actually experienced a decline during this time period.

The price-recovery component indicates the extent an airline increases its fares relative to related increases in costs, holding all else equal. It is an indicator of product differentiation. As seen in Table 7a, US Airways experienced very positive contributions to profitability, followed by United and Northwest, while all other airlines were unable to raise fares in an amount sufficient to cover increased costs. Alaska ranked last in this category during this period, followed by Delta.

The productivity component was positive for all seven carriers. Delta led the way in this category, followed by Alaska, with Northwest and United ranking sixth and seventh respectively. Examining the price-recovery and productivity components together suggests that Northwest and United followed a product differentiation strategy while Delta and Alaska led the way in cost cutting to improve productivity. Finally, US Airways ranked first in improved profitability through management of capacity, and all but Continental showed increased profitability related to capacity changes.

Table 7b shows the rankings (now with US Airways excluded) for the three-year period ending in 2009, after normalizing the data using RPMs in billions. The growth component rankings are similar during this period. Continental again ranked first of the six airlines while Alaska slipped to third place from second in the earlier period. Northwest and United were at the bottom, though in reverse order from the earlier period. But notably, changes in the overall market resulted in decreases in profitability for Northwest, United, and also American.

Table 5: Example: Delta Airlines – Data Used in Strategic Variance Analysis

	2003	2006	2009
Total operating revenues ($)	14,203,030,000	17,339,136,000	18,046,578,000
Revenue passenger miles (RPMs)	89,135,332,782	98,748,194,606	100,582,412,275
Average revenue per RPM	0.159	0.176	0.179
Revenue passenger miles (RPMs)	89,135,332,782	98,748,194,606	100,582,412,275
Available seat miles (ASMs)	119,886,312,311	125,073,038,393	122,149,414,544
Passenger load factor (%)	74.35%	78.95%	82.34%
Hence, budgeted available seat miles	121,619,209,417	132,815,534,864	127,396,232,026
Revenue passenger miles (RPMs)	89,135,332,782	98,748,194,606	100,582,412,275
Revenue passenger enplanements	84,076,432	73,524,956	67,744,784
Average revenue passenger miles per passenger ($)	1060.17	1343.06	1484.73
Hence, budgeted revenue passenger enplanements	87,386,930	93,143,713	74,890,660
Number of gallons used	2,009,322,668	1,932,690,482	1,934,723,833
Available seat miles (ASMs)	119,886,312,311	125,073,038,393	122,149,414,544
Average number of gallons per ASM	0.0167602	0.0154525	0.0158390
Total flight-related costs ($)	10,141,131,218	9,942,101,013	10,584,040,149
Available seat miles (ASMs)	119,886,312,311	125,073,038,393	122,149,414,544
Average flight-related cost per ASM ($)	0.085	0.079	0.087
Total passenger-related costs ($)	3,625,010,000	3,296,935,000	3,404,133,000
Revenue passenger enplanements	84,076,432	73,524,956	67,744,784
Average cost per revenue passenger ($)	43.12	44.84	50.25
Revenue passenger (RPMs)	89,135,332,782	98,748,194,606	100,582,412,275
Available seat miles (ASMs)	119,886,312,311	125,073,038,393	122,149,414,544
Idle or unused capacity (ASMs)	30,750,979,530	26,324,843,787	21,567,002,269
Hence, budgeted idle capacity (ASMs)	32,483,876,636	34,067,340,258	26,813,819,751

Data Sources: 1) International Civil Aviation Organization, *Financial Data: Commercial Air Carriers, Series F*, Montreal, Quebec, Canada, 2003, 2006, and 2009, 2) International Civil Aviation Organization, *Traffic: Commercial Air Carriers, Series T*, Montreal, Quebec, Canada, 2003, 2006, and 2009, and 3) U.S. Department of Transportation, Research and Innovative Administration, Bureau of Transportation Statistics, *TranStats Database*, Washington, D.C., 2003, 2006, and 2009.

The price-recovery component indicates a dramatic change in the rankings for Alaska, going from last to first, while United maintained its second place ranking. Alaska was also the only airline of the six to increase fares in sufficient amount to cover related increases in costs. American and Continental, which were fourth and fifth respectively in the earlier period, slipped to fifth and sixth during the latter period.

Alaska ranked first in productivity for the three years ending 2009, while Delta slipped from first to fourth place. The results for Alaska are impressive, as it not only ranked first in price-recovery, but also first in productivity. Alaska was successful in cutting costs and also in raising fares rather than passing along the cost savings to its customers. American slipped to last place in productivity, but all six airlines experienced increases in profitability through productivity gains.

Delta, United, and Continental improved profitability through capacity management, while American, Alaska, and Northwest saw profitability decreases during the period related to capacity management.

STAGE LENGTH, DOMESTIC VERSUS FOREIGN OPERATIONS, AND SVA RANKINGS

Stage or average flight length is a concept that captures economies of distance. It has been suggested that there is a correlation between average flight length and unit cost. This occurs because for a given aircraft size, increasing the distance of a flight results in larger output volume as measured in RPMs. However, it must be noted that, empirically, this posited effect has been shown to be ambiguous (Caves et al. 1981 and Tretheway 1984).

The ratio of domestic scheduled revenue passenger-miles to international schedule passenger-miles captures the international focus of an airline. A priori, the impact of this measure is not unambiguous, although there are arguments to suggest a potential negative influence on operational efficiency. Fethi et al. (2002) suggest that an increase in the international focus of an airline exposes it to spatial disparities in its operating environment. In structuring bilateral agreements, the international air transport system has tended to focus on individual or small sets of routes between countries. This has impeded the achievement of high levels of efficiency over global networks of air services. There are unresolved issues with regard to ownership and control, cabotage and the right of establishment (the setting up and management of companies). There is still divergence across geographic regions with regard to competition law and policy in air transport. There are differences in fiscal policies with air transport being subjected to many taxes, which is finance general governmental expenditure, while customs clearance can impede both speed and reliability. Finally, airport infrastructure constraints can significantly affect the level of competition in particular markets.

Pearson correlation coefficients were calculated between an airlines' ranking on each component of the SVA analysis and their corresponding rankings for stage length and the ratio of domestic scheduled revenue passenger-miles to foreign scheduled revenue passenger-miles. There were no statistically significant correlations for either the 2004-2006 time period or the 2007-2009 time period.

FURTHER ANALYSIS OF THE GROWTH COMPONENT AND CONCLUSIONS

The domestic airline industry was rocked by the 9/11 tragedy and in the years following 9/11. This was coupled with a general economic downturn that lasted approximately three years. As traffic increased to pre-9/11 levels, the industry began to experience tremendous increases in fuel costs that threatened the very existence of many airlines. The industry was again severely hit, beginning in mid-2008, by the worst economic recession since the 1930s. Particularly hard hit were the legacy or network carriers. Management of these airlines was tasked with developing strategies to deal with dramatic changes in growth and the cost of inputs.

Table 6a: Strategic Variance Analysis 2004-2006

	Alaska	American	Continental	Delta	Northwest	United	US Airways	Composite
GROWTH COMPONENT 2004-2006								
Revenue effect	453,691,878	2,811,775,915	2,496,491,053	1,531,735,627	553,888,048	1,727,294,826	-66,291,108	9,855,630,117
Fuel cost effect	-66,403,583	-388,327,209	-358,212,552	-171,911,836	-84,464,216	-248,461,285	7,094,394	-1,317,325,858
Flight-related cost effect	-175,151,540	-1,375,345,063	-1,061,955,929	-813,147,817	-227,598,043	-890,324,602	33,377,004	-4,780,185,949
Passenger-related effect	-139,294,499	-768,232,901	-728,649,836	-390,941,719	-191,634,632	-514,421,314	17,788,048	-2,820,943,581
TOTAL	**72,842,256**	**279,870,742**	**347,672,736**	**155,734,255**	**50,191,158**	**74,087,625**	**-8,031,663**	**937,174,729**
PRICE-RECOVERY COMPONENT 2004-2006								
Revenue effect	211,439,122	2,278,247,085	3,180,486,947	1,604,370,373	2,817,239,952	4,208,835,174	1,380,200,108	15,333,774,883
Fuel cost effect	-471,710,024	-3,828,438,185	-1,853,965,777	-2,920,895,535	-2,246,447,729	-2,841,063,847	-1,007,233,236	-15,222,020,603
Flight-related cost effect	-133,242,925	865,320,879	-1,671,102,977	503,537,331	-700,464,092	-1,029,314,359	-158,519,829	-2,032,146,563
Passenger-related effect	59,044,396	436,067,853	25,400,970	-160,708,624	353,833,643	687,418,915	217,983,665	1,493,693,325
TOTAL	**-334,469,432**	**-248,802,368**	**-319,180,837**	**-973,696,455**	**224,161,774**	**1,025,875,882**	**432,430,708**	**-426,698,958**

Table 6a (continued)

	Alaska	American	Continental	Delta	Northwest	United	US Airways	Composite
_PRODUCTIVITY COMPONENT 2004-2006								
Fuel cost effect	50,035,532	481,709,093	204,174,231	365,698,506	194,445,736	87,427,468	56,814,411	1,508,342,435
Fuel (ASM) cost effect	67,859,727	560,049,736	212,520,098	251,902,660	313,814,762	340,760,327	105,158,016	1,842,933,707
Passenger-related effect	48,306,103	246,734,048	268,723,866	879,725,343	8,554,989	269,628,399	168,608,287	2,121,185,256
TOTAL	**166,201,363**	**1,288,492,877**	**685,418,195**	**1,497,326,509**	**516,815,487**	**697,816,193**	**330,580,715**	**5,472,461,399**
CAPACITY UNDERUTILIZATION COMPONENT 2004-2006								
Unused capacities	-40,752,430	214,467,764	-378,268,935	134,235,787	-125,392,998	-224,154,281	-44,119,994	-481,362,397
Available capacities	-131,982,297	-649,794,077	-1,016,842,088	-438,742,912	164,855,537	-459,679,021	335,692,238	-2,470,754,722
Used capacities	175,151,540	1,375,345,063	1,061,955,929	813,147,817	227,598,043	890,324,602	-33,377,004	4,780,185,949
TOTAL	**2,416,813**	**940,018,750**	**-333,155,094**	**508,640,691**	**267,060,581**	**206,491,299**	**258,195,240**	**1,828,068,830**

Table 6b: Strategic Variance Analysis 2007-2009

	Alaska	American	Continental	Delta	Northwest	United	Composite
GROWTH COMPONENT 2007-2009							
Revenue effect	76,392,142	-2,746,117,173	247,721,124	322,069,175	-1,788,986,906	-2,792,013,981	-6,782,251,227
Fuel cost effect	-20,341,412	681,059,676	-54,221,482	-75,585,266	459,271,131	662,631,241	1,631,023,084
Flight-related cost effect	-30,956,254	1,101,536,116	-111,433,874	-145,802,625	669,969,292	1,274,484,766	2,898,030,959
Passenger-related effect	-18,566,661	590,939,477	-49,027,225	-61,239,564	428,428,256	512,292,668	1,390,268,958
TOTAL	**6,527,814**	**-372,581,904**	**33,038,544**	**39,441,720**	**-231,318,227**	**-342,605,306**	**-862,928,226**
PRICE-RECOVERY COMPONENT 2007-2009							
Revenue effect	237,099,858	151,015,173	-896,725,124	385,372,825	97,349,906	-182,607,019	-107,178,773
Fuel cost effect	103,408,138	5,602,930	114,270,960	-600,032,058	595,433,020	522,238,504	669,748,078
Flight-related cost effect	-202,025,261	-1,440,766,152	-39,062,189	-719,963,590	-868,515,032	-363,159,189	-3,749,230,763
Passenger-related effect	-9,109,301	-377,711,018	-272,718,665	-405,034,217	-373,895,922	-227,871,310	-1,598,991,366
TOTAL	**129,373,433**	**-1,661,859,067**	**-1,094,235,018**	**-1,339,657,040**	**-549,628,027**	**-251,399,014**	**-4,785,652,825**

Table 6b (continued)

	Alaska	American	Continental	Delta	Northwest	United	Composite
PRODUCTIVITY COMPONENT 2007-2009							
Fuel cost effect	85,057,117	8,308,068	141,677,759	-118,679,257	227,211,753	50,184,026	544,457,269
Fuel (ASM) cost effect	19,440,806	31,884,475	28,810,763	200,305,717	-24,843,792	-9,110,740	188,753,647
Passenger-related effect	81,661,963	23,640,541	223,950,890	359,075,781	386,617,666	178,274,642	1,198,430,408
TOTAL	**186,159,886**	**63,833,084**	**394,439,412**	**440,702,242**	**588,985,628**	**219,347,928**	**1,931,641,323**
CAPACITY UNDERUTILIZATION COMPONENT 2007-2009							
Unused capacities	-52,444,574	-345,352,446	-8,320,470	-154,375,462	-168,581,670	-80,286,845	-828,939,806
Available capacities	11,477,186	1,439,083,450	-57,020,340	232,399,916	729,066,589	1,527,048,003	4,017,372,492
Used capacities	30,956,254	-1,101,536,116	111,433,874	145,802,625	-669,969,292	-1,274,484,766	-2,898,030,959
TOTAL	**-10,011,134**	**-7,805,112**	**46,093,063**	**223,827,079**	**-109,484,373**	**172,276,392**	**290,401,727**

Table 7a: Normalized Strategic Variance Analysis 2004-2006

	Alaska	American	Continental	Delta	Northwest	United	US Airways	Composite
GROWTH COMPONENT 2004-2006	**2**	**3**	**1**	**4**	**5**	**6**	**7**	
Revenue effect	25,473,465	20,175,983	32,747,227	15,511,530	7,632,226	14,735,230	-1,774,916	17,621,381
Fuel cost effect	-3,728,366	-2,786,454	-4,698,782	-1,740,911	-1,163,863	-2,119,577	189,949	-2,355,314
Flight-related cost effect	-9,834,244	-9,868,830	-13,929,997	-8,234,559	-3,136,157	-7,595,193	893,655	-8,546,737
Passenger-related effect	-7,820,977	-5,512,478	-9,557,920	-3,958,976	-2,640,604	-4,388,432	476,267	-5,043,708
TOTAL	**4,089,879**	**2,008,221**	**4,560,528**	**1,577,085**	**691,602**	**632,028**	**-215,044**	**1,675,622**
PRICE-RECOVERY COMPONENT 2004-2006	**7**	**4**	**5**	**6**	**3**	**2**	**1**	
Revenue effect	11,871,685	16,347,631	41,719,408	16,247,086	38,819,781	35,904,788	36,954,265	27,416,033
Fuel cost effect	-26,485,131	-27,471,074	-24,319,029	-29,579,230	-30,954,626	-24,236,586	-26,968,237	-27,216,222
Flight-related cost effect	-7,481,199	6,209,136	-21,920,362	5,099,205	-9,651,951	-8,780,889	-4,244,300	-3,633,378
Passenger-related effect	3,315,169	3,129,018	333,192	-1,627,459	4,875,603	5,864,243	5,836,419	2,670,650
TOTAL	**-18,779,475**	**-1,785,289**	**-4,186,791**	**-9,860,398**	**3,088,807**	**8,751,556**	**11,578,146**	**-762,917**

Note: Numbers in shaded areas are rankings, from 1 to 7, of the effect of a component on operating income.

Table 7a (continued)

	Alaska	American	Continental	Delta	Northwest	United	US Airways	Composite
PRODUCTIVITY COMPONENT 2004-2006	**2**	**3**	**4**	**1**	**6**	**7**	**5**	
Fuel cost effect	2,809,348	3,456,518	2,678,215	3,703,344	2,679,339	745,827	1,521,181	2,696,842
Fuel (ASM) cost effect	3,810,124	4,018,654	2,787,690	2,550,960	4,324,169	2,906,963	2,815,561	3,295,075
Passenger-related effect	2,712,246	1,770,448	3,524,932	8,908,774	117,882	2,300,150	4,514,414	3,792,575
TOTAL	**9,331,718**	**9,245,620**	**8,990,837**	**15,163,077**	**7,121,390**	**5,952,940**	**8,851,157**	**9,784,491**
CAPACITY UNDERUTILIZATION COMPONENT 2004-2006	**6**	**2**	**7**	**3**	**4**	**5**	**1**	
Unused capacities	-2,288,129	1,538,920	-4,961,868	1,359,375	-1,727,836	-1,912,218	-1,181,294	-860,652
Available capacities	-7,410,418	-4,662,617	-13,338,225	-4,443,047	2,271,605	-3,921,436	8,988,015	-4,417,588
Used capacities	9,834,244	9,868,830	13,929,997	8,234,559	3,136,157	7,595,193	-893,655	8,546,737
TOTAL	**135,697**	**6,745,133**	**-4,370,096**	**5,150,886**	**3,679,926**	**1,761,539**	**6,913,067**	**3,268,497**

Note: Numbers in shaded areas are rankings, from 1 to 7, of the effect of a component on operating income.

Table 7b: Normalized Strategic Variance Analysis 2007-2009

	Alaska	American	Continental	Delta	Northwest	United	Composite
GROWTH COMPONENT 2007-2009	**3**	**4**	**1**	**2**	**6**	**5**	
Revenue effect	4,170,858	-22,445,070	3,188,719	3,202,043	-28,747,399	-27,838,296	-14,086,888
Fuel cost effect	-1,110,600	5,566,562	-697,950	-751,476	7,380,071	6,606,888	3,387,672
Flight-related cost effect	-1,690,150	9,003,278	-1,434,400	-1,449,584	10,765,800	12,707,488	6,019,276
Passenger-related effect	-1,013,703	4,829,975	-631,089	-608,850	6,884,454	5,107,909	2,887,620
TOTAL	**356,406**	**-3,045,255**	**425,279**	**392,133**	**-3,717,074**	**-3,416,010**	**-1,792,321**
PRICE-RECOVERY COMPONENT 2007-2009	**1**	**5**	**6**	**4**	**3**	**2**	
Revenue effect	12,945,178	1,234,305	-11,542,836	3,831,414	1,564,325	-1,820,717	-222,613
Fuel cost effect	5,645,877	45,795	1,470,920	-5,965,576	9,568,069	5,207,076	1,391,082
Flight-related cost effect	-11,030,175	-11,775,935	-502,817	-7,157,947	-13,956,250	-3,620,946	-7,787,237
Passenger-related effect	-497,350	-3,087,177	-3,510,492	-4,026,889	-6,008,169	-2,272,033	-3,321,141
TOTAL	**7,063,531**	**-13,583,012**	**-14,085,225**	**-13,318,999**	**-8,832,025**	**-2,506,621**	**-9,939,909**

Note: Numbers in shaded areas are rankings, from 1 to 6, of the effect of a component on operating income.

Table 7b (continued)

Table 7b (continued)

	Alaska	American	Continental	Delta	Northwest	United	Composite
PRODUCTIVITY COMPONENT 2007-2009	**1**	**6**	**3**	**4**	**2**	**5**	
Fuel cost effect	4,643,948	67,905	1,823,706	-1,179,921	3,651,087	500,369	1,130,850
Fuel (ASM) cost effect	1,061,429	260,604	370,858	1,991,459	-399,217	-90,840	392,046
Passenger-related effect	4,458,580	193,223	2,882,743	3,569,966	6,212,596	1,777,521	2,489,167
TOTAL	**10,163,957**	**521,732**	**5,077,308**	**4,381,504**	**9,464,466**	**2,187,049**	**4,012,063**
CAPACITY UNDERUTILIZATION COMPONENT 2007-2009	**5**	**4**	**3**	**1**	**6**	**2**	
Unused capacities	-2,863,369	-2,822,698	-107,103	-1,534,816	-2,708,955	-800,515	-1,721,727
Available capacities	626,631	11,762,182	-733,978	2,310,542	11,715,440	15,225,717	8,344,173
Used capacities	1,690,150	-9,003,278	1,434,400	1,449,584	-10,765,800	-12,707,488	-6,019,276
TOTAL	**-546,588**	**-63,794**	**593,320**	**2,225,310**	**-1,759,315**	**1,717,714**	**603,171**

Note: Numbers in shaded areas are rankings, from 1 to 6, of the effect of a component on operating income.

Horngren et al.'s (2012) SVA analysis provides a useful technique to understand how management of these airlines developed strategies to deal with these challenges. In terms of productivity, during the three-year period from 2004 to 2006, all seven airlines were successful in cutting costs, with Delta and Alaska leading the way. This trend continued in the three-year period from 2007 to 2009, with Alaska and Northwest leading the way. In terms of price recovery, management of US Airways, United, and Northwest were successful in differentiating their service, as they were the only airlines able to raise fares in amounts sufficient to cover increased costs in the earlier period. Alaska showed dramatic improvement in raising fares during the latter period in an amount sufficient to cover increased costs.

Horngren et al. (2012) suggest that some changes in profitability may be exogenous to a company, such as an overall improvement in the economy. Other changes may be endogenous, such as improvements that result from management's strategic decisions to increase productivity or raise selling prices. They also explain that companies that successfully implement a cost leadership strategy will generally exhibit favorable growth and favorable productivity. In contrast, companies that successfully implement a product differentiation strategy will generally exhibit favorable growth and favorable price-recovery. Implicit is an assumption that management will choose exclusively either a productivity-based strategy or a product differentiation strategy.

We believe the assumption of one exclusive strategy is too strong, and that management may choose a blended strategy. For example, even though management may decide upon a strategy of product differentiation, which often means they can successfully raise selling prices, it doesn't preclude them from also trying to increase productivity. In terms of the SVA, the importance of this relates to adjustments made to the variances calculated to take into consideration industry-wide or exogenous factors. Horngren et al. (2012) assume, a priori, a cost leadership strategy when they illustrate SVA. Thus, they make market adjustments to the growth component and the productivity component. Since we do not know, a priori, management's choice of strategy, and since management may follow a blended strategy at that, we only adjust the growth component for industry-wide factors.

In Tables 8a and 8b, we calculate the percentage change in RPMs for each network carrier. We also calculate a composite change for the network carriers in total. Table 8a is for the three-year period ending in 2006, and Table 8b is for the three-year period ending in 2009. Using Delta Airlines as an example, in the three-year period ending in 2006, Delta's RPMs increased by 10.60%. Taken by itself, this appears to be impressive growth. However, the composite for the network carriers grew by 13.63%. If one assumes that Delta should have met the composite growth rate, then the net effect on Delta's income for the period would be approximately $198 million. However, as shown in Table 6a, the net effect of growth on income for Delta was only approximately $154 million. Therefore, adjusting for the market impact, Delta actually fell short by approximately $44 million, in terms of the growth component.

The market adjustment to the growth component is also very revealing in the three-year period ending in 2009. Table 6b shows that Delta experienced a modest increase in net income of approximately $39 million due to growth. However, Table 8b shows that the composite for the network carriers was a decrease in RPMs of 7.64%. Delta's increase in RPMs during this period was 1.84%. Compared with all network carriers, this represents a 515% improvement in performance. If one assumes that Delta should have equaled the composite decrease in growth, then the net effect on Delta's income for the period would be a loss of approximately $163 million. Since Delta in fact produced an increase in income due to growth of approximately $39 million, it is as if it overcame a loss of $163 million to do so. Viewed in that perspective, it is equivalent to an increase of approximately $202 million ($39 million minus a loss of $163 million).

SVA is a useful management tool for analyzing strategies used to improve profitability. In the airline industry, many strategic decisions are made that, when implemented, may take several years to reach their full effect on company profits. This includes long-term fuel hedges and changes in capacity (adding planes, deleting routes, and reconfiguring seating). This paper illustrates that SVA

may be performed for longer-term time frames to analyze strategic decisions. Further, the analysis shows the benefits of benchmarking performance against a peer group of companies, in this case the U.S. network airlines. The analysis indicated that Alaska Airlines in particular made great strides in improving profitability by not only cutting costs to improve productivity, but also increasing fares sufficiently to more than cover increases in fuel costs, which had risen dramatically during the period.

Table 8a: Impact of Endogenous Strategies - Growth Component, 2004-2006

	RPMs 2004	RPMs 2006	%Δ2004-2006	ENDOGENOUS
Alaska	14,553,539,641	17,822,404,781	22.46	39.31%
American	120,299,948,302	139,420,782,629	15.89	14.22%
Continental	57,577,384,885	76,302,518,293	32.52	58.09%
Delta	89,412,207,707	98,887,497,017	10.60	-28.58%
Northwest	68,746,644,596	72,674,331,902	5.71	-138.70%
United	104,371,719,160	117,445,990,416	12.53	-8.78%
US Airways	37,774,319,226	37,357,913,286	-1.10	-1339.09%
Composite	492,735,763,516	559,911,438,325	13.63	

Endogenous Effect = $[\%\Delta RPMs(2004\text{-}2006)_{Airline\ i} - \%\Delta RPMs(2004\text{-}2006)_{Market}] / |\%\Delta RPMs(2004\text{-}2006)_{Airline\ i}|$

Table 8b: Impact of Endogenous Strategies - Growth Component, 2007-2009

	RPMs 2007	RPMs 2009	%Δ2007-2009	ENDOGENOUS
Alaska	17,822,404,781	18,361,670,904	3.03	352.15%
American	139,420,782,629	122,391,483,735	-12.21	-37.43%
Continental	76,302,518,293	77,768,332,936	1.92	497.92%
Delta	98,887,497,017	100,711,842,838	1.84	515.22%
Northwest	72,674,331,902	62,941,173,546	-13.39	-42.94%
United	117,445,990,416	100,453,973,793	-14.47	-47.23%
Composite	522,553,525,039	482,628,477,752	-7.64	

Endogenous Effect = $[\%\Delta RPMs(2007\text{-}2009)_{Airline\ i} - \%\Delta RPMs(2007\text{-}2009)_{Market}] / |\%\Delta RPMs(2007\text{-}2009)_{Airline\ i}|$

APPENDIX – Calculation of Strategic Variances from Year i to Year j

The Growth Component

1. **Airline Revenues**
   [*Revenue effect of the Growth Component (i.e., lower expected revenue due to lower RPM)*]
   Variance = {Year i revenue/RPM} * {Year j RPMs – Year i RPMs}

2. **Fuel Costs**
   [*Fuel cost effect of the Growth Component (i.e., lower expected fuel costs due to lower RPMs)*]
   Variance = {Year i fuel cost/gallon} * {Year i gallons used per ASM} * {Year i actual ASMs – Year j budgeted ASMs}

3. **Flight-related Costs**
   [Flight-related cost effect of the Growth Component (i.e., lower expected □ight-related costs ***due to lower RPMs)*]**
   Variance = {Year i cost/ASM} * {Year i passenger load factor} * {Year i actual ASMs – Year j budgeted ASMs}

4. **Passenger-related Costs**
   [*Passenger-related cost effect of the Growth Component (i.e., lower expected passenger-related costs due to lower RPMs)*]
   Variance = {Year i cost/passenger} * {Year i revenue passengers – Year j budgeted revenue passengers}

The Price-Recovery Component

1. **Airline Revenues**
   [*Revenue effect of the Price-Recovery Component (i.e., higher revenue due to higher airfares)*]
   Variance = {Year j RPMs} * {Year j revenue/RPM – Year i revenue/RPM}

2. **Fuel Costs**
   [*Fuel cost effect of the Price-Recovery Component (i.e., higher costs due to higher fuel prices)*]
   Variance = {Year j budgeted ASMs} * {Year i gallons used/ASM} * {Year i fuel cost/gallon – Year j fuel cost/gallon}

3. **Flight-related Costs**
   [*Flight-related cost effect of the Price-Recovery Component (i.e., higher costs due to higher* □ight-related costs per ASM)]**
   Variance = {Year j passenger load factor} * {Year j actual ASMs} * {Year i cost/ASM – Year j cost/ASM}

4. **Passenger-related Costs**
   [*Passenger-related cost effect of the Price-Recovery Component (i.e., higher costs due to higher costs per passenger)*]
   Variance = {Year j budgeted revenue passengers} * {Year i cost/passenger – Year j cost/passenger}

The Productivity Component

1. **Fuel Costs (a)**
   [*Fuel cost effect of the Productivity Component (i.e., lower costs due to lower fuel usage per gallon)*]
   Variance = {Year j fuel cost/gallon} * {Year j budgeted ASMs} * {Year i gallons used /ASM – Year j gallons used/ASM}

2. **Fuel Costs (b)**
   [*Fuel (ASM) cost effect of the Productivity Component (i.e., lower costs due to higher passenger load factor)*]
   Variance = {Year j fuel cost/gallon} * {Year j gallons used/ASM} * {Year j budgeted ASMs – Year j actual ASMs}

3. **Passenger-related costs**
   [*Passenger-related cost effect of the Productivity Component (i.e., lower costs due to higher miles per passenger)*]
   Variance = {Year j cost/passenger} * {Year j budgeted revenue passengers – Year j revenue passengers}

The Capacity Underutilization Component

1. **Flight-related costs (a)**
   [Changes in □ight-related costs relating to unused capacities (i.e., higher unit costs to ***acquire capacity that is unused)*****]**
   Variance = {Year j actual ASMs – Year j RPMs} * {Year i cost/ASM – Year j cost/ASM}

2. **Flight-related costs (b)**
   [Changes in □ight-related costs of available capacities (i.e., lower underutilization due to ***decrease in available capacity)*****]**
   Variance = {Year i cost/ASM} * {Year i actual ASMs – Year j actual ASMs}

3. **Flight-related costs (c)**
   [Changes in □ight-related costs of used capacities (i.e., higher underutilization due to ***decrease in capacity used)*****]**
   Variance = {Year i cost/ASM} * {Year j RPMs – Year i RPMs}

Endnotes

1. It wasn't possible to have data for a year later than 2009 since the study would have lost Northwest Airlines, which by 2010 had been fully assimilated into Delta Airlines. Full and separate non-consolidated data were available for Northwest through 2009. However, this was not the case for US Airways as unconsolidated data were available only through 2007, after which US Airways and America West data are both consolidated.

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Transportation Research Forum

Statement of Purpose

The Transportation Research Forum is an independent organization of transportation professionals. Its purpose is to provide an impartial meeting ground for carriers, shippers, government officials, consultants, university researchers, suppliers, and others seeking an exchange of information and ideas related to both passenger and freight transportation. The Forum provides pertinent and timely information to those who conduct research and those who use and benefit from research.

The exchange of information and ideas is accomplished through international, national, and local TRF meetings and by publication of professional papers related to numerous transportation topics.

The TRF encompasses all modes of transport and the entire range of disciplines relevant to transportation, including:

- Economics
- Marketing and Pricing
- Financial Controls and Analysis
- Labor and Employee Relations
- Carrier Management
- Organization and Planning
- Technology and Engineering
- Transportation and Supply Chain Management
- Urban Transportation and Planning
- Government Policy
- Equipment Supply
- Regulation
- Safety
- Environment and Energy
- Intermodal Transportation

History and Organization

A small group of transportation researchers in New York started the Transportation Research Forum in March 1958. Monthly luncheon meetings were established at that time and still continue. The first organizing meeting of the American Transportation Research Forum was held in St. Louis, Missouri, in December 1960. The New York Transportation Research Forum sponsored the meeting and became the founding chapter of the ATRF. The Lake Erie, Washington D.C., and Chicago chapters were organized soon after and were later joined by chapters in other cities around the United States. TRF currently has about 300 members.

With the expansion of the organization in Canada, the name was shortened to Transportation Research Forum. The Canadian Transportation Forum now has approximately 300 members.

TRF organizations have also been established in Australia and Israel. In addition, an International Chapter was organized for TRF members interested particularly in international transportation and transportation in countries other than the United States and Canada.

Interest in specific transportation-related areas has recently encouraged some members of TRF to form other special interest chapters, which do not have geographical boundaries – Agricultural and Rural Transportation, High-Speed Ground Transportation, and Aviation. TRF members may belong to as many geographical and special interest chapters as they wish.

A student membership category is provided for undergraduate and graduate students who are interested in the field of transportation. Student members receive the same publications and services as other TRF members.

Annual Meetings

In addition to monthly meetings of the local chapters, national meetings have been held every year since TRF's first meeting in 1960. Annual meetings generally last three days with 25 to 35 sessions. They are held in various locations in the United States and Canada, usually in the spring. The Canadian TRF also holds an annual meeting, usually in the spring.

Each year at its annual meeting the TRF presents an award for the best graduate student paper. Recognition is also given by TRF annually to an individual for Distinguished Transportation Research and to the best paper in agriculture and rural transportation.

Annual TRF meetings generally include the following features:

- Members are addressed by prominent speakers from government, industry, and academia.
- Speakers typically summarize (not read) their papers, then discuss the principal points with the members.
- Members are encouraged to participate actively in any session; sufficient time is allotted for discussion of each paper.
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