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AVIATION INDUSTRY EMPLOYMENT DATA ESTIMATES REVISITED

David A. NewMyer, Robert W. Kaps, and Susan E. Sharp

A wide variety of estimates of aviation industry employment data exist today. For example, a range of estimates from a low of 750,000 to a high of 2.1 million are reported in various industry publications and journals. This broad range raises questions not only about such data but also about the definition used to define the industry and thus used to arrive at employment numbers. In this paper, an overall 1995 aviation industry employment estimate is presented that is based on various secondary sources. The estimate incorporates various components of the civil aviation industry, including aircraft/aerospace manufacturing, airlines, general aviation, government aviation, and miscellaneous aviation industry employment. Active duty military personnel are a significant contributor to aviation employment. Although they are not included in previous assessments of overall civil aviation employment, they have been included in this work. One article (NewMyer, 1985) estimated aviation employment at 2,286,709. This new assessment indicates an industry increase of 62,290 employees to a total population of 2,349,399. Data collection for this new computation was obtained through replication of the methodology producing the 1985 statistics. The primary contributing factor to overall aviation industry employment increases in 1995 is the fact that there were net increases in four of the six components of the aviation industry (aviation/aerospace manufacturing, airlines, general aviation, government aviation, miscellaneous, and active duty military aviation personnel). It is concluded, however, that without the miscellaneous employment category contribution to employment statistics, there is actually a decline in industry employment over the 10-year period. Contributing to this descent have been large personnel reductions in the defense-related aircraft/aerospace manufacturing industry and active duty military aviation components.

STATEMENT OF THE PROBLEM

There are a number of ways in which to consistently quantify various aspects of the aviation industry--total sales, units produced, etc. However, one area that is difficult to quantify for the entire aviation industry, including each of its major segments, is employment. An illustration of this problem is the range of numbers with which various authors have referred to aviation industry employment over the years. In a recently released National Research Council report (1997), the following description of aviation industry employment is used:

In 1993, 737,000 people worked in the air transport industry (Table 2-4). Another 542,000 people were involved in manufacturing aircraft and aircraft parts, and 53,000 people worked for the Federal Aviation Administration overseeing, regulating and promoting

the nation's airways and aviation system. These numbers reflect employment as measured by federal surveys of business establishments, classified by industry groups. (p. 31)

Lassier (1996) presents another view of aviation industry employment:

The highly diverse aviation and aerospace industry in the United States not only serves the traveling public and the world's defense establishments, but it has considerable impact on the U.S. economy as a source of employment. It is closely linked to the nation's economic cycle, and since 1960 labor demands have shifted cyclically between critical shortage and excess supply. Depending on the cycle of boom or bust, the industry employs between 750,000 and 1.3 million

Employment Data Estimates Revisited

pilots, mechanics, engineers, computer scientists, reservation clerks, and other specialties. (p. 10)

Yet a third view is contained in an article that appeared in *Aviation Week and Space Technology* ("Recovery Improving Employment Outlook," 1996). In this instance, it is obvious to those who are intimately familiar with the industry that the article is referring to airframe, engine, parts, and related aerospace industry manufacturing related employment figures. However, to others the article may seem to be referring to aviation as a whole:

U.S. aerospace industry employment, riding the crest of commercial aircraft recovery, is finally rising again after bottoming earlier this year. In September [1995], the last month for which complete data is available, the number of production workers edged up more than 4% to about 260,000 from an average of 251,000 for all of 1995. But total employment of about 796,000 in September is virtually flat compared with the average number for all of last year. (p. 46)

Finally, another article (NewMyer, 1985) concluded that:

The civilian aviation industry employs approximately 2,074,190 people in five key industry segments. Of this total employment figure, 81.3 percent of it is based on industry data, 16.6 percent of it is based on industry estimates and 2.1 percent of it is based on author's estimates. Even though there are a large number of existing industry data sources covering 97.9 percent of the aviation industry employment, formats and data management methods vary widely. This lack of consistency in the data leads to difficulty in using the data. (pp. 41-42)

Even though these publications rely on data from different sources and are not necessarily comparable in terms of date sequence, one can immediately detect the inconsistency in the data. First of all, one publication used a range of data (750,000 to 1.3 million) to represent industry-wide employment data. Another focused on

aircraft manufacturing and air transport data, which rendered a total industry employment figure of about 1.33 million employees. A third source, which refers to aviation industry employment in the title and text of the article but is really referring only to the aviation/aerospace manufacturing segment of the industry, arrives at a total of 796,000 employees. Finally, a fourth source arrives at an aviation industry employment total of about 2.1 million employees. Taking the extreme of the various ranges quoted in these sources provides an overall range of aviation industry employment from a low of 750,000 to a high of 2.1 million. This is hardly a precise definition of aviation industry employment.

Why is it important to provide a precise definition of aviation industry employment?

First of all, employment is an important measure of the worth of any industry. For example, a government agency or a corporate entity will describe the success or failure of its policies in terms of the impact the policy has had on employment.

Also, new capital improvements to airports and other such facilities are described positively in terms of the effect on employment.

Finally, one of the first questions asked of academic institutions when they propose changes to aviation degree programs is what the employment-related impact of the program change will be.

The purpose of this article is to provide a documented estimate of civilian aviation industry employment, to include the aviation/aerospace, airline, general aviation, government, and "other" or miscellaneous segments. Specifically, this paper will address the following:

1. A definition of the aviation industry and its segments will be provided as a basis for this paper.
2. Various sources of aviation industry employment data will be reviewed by industry segment.
3. An estimate of aviation industry employment data will be provided for the year 1995.
4. A comparison of this estimate with other sources of aviation industry employment data will be provided, including a discussion of possible reasons for the difference in the various estimates.
5. Implications for further research of the topic of

aviation industry employment data will be presented.

METHODOLOGY

To provide an estimate of aviation employment, as well as to compare the 1995 aviation industry employment market with that in 1985, a common definition of the aviation industry and its components must be used. In the 1985 paper, and in concert with the Truitt definition, active duty military aviation personnel were excluded from discussion. Therefore, to maintain consistency, civilian components of the U.S. domestic aviation industry will be first to be discussed. For uniformity purposes these components are defined as:

1. **Aviation/aerospace manufacturing:** Private sector civil (air, transport, general aviation, and helicopter), defense-related, and space-related manufacturing employment.

2. **Airlines:** Majors (defined as those having gross revenues in excess of \$1.0 billion), nationals (revenues between \$100 million and \$1.0 billion), regionals (carriers with gross revenues up to \$75 million), and all cargo carriers.

3. **General aviation:** Not including manufacturing but including all flying and flight-support activities except that done directly by the military, the scheduled airlines, and civil government agencies.

4. **Government:** Federal (e.g., Federal Aviation Administration), state aeronautical agencies, and local government operated airports, etc.

5. **Miscellaneous:** Travel agents, air freight forwarders, aviation industry associations, and other supporting facets of the aviation industry.

In addition, active duty military related employment numbers will be added to the 1995 estimate. For comparative purposes, 1985 active duty employment numbers will be added to the 1985 civilian estimate to provide comparable figures and the most complete set of figures.

Collection of aviation industry employment data is difficult, in general, because of the industry's multi-faceted character. By its nature, it is an industry cutting across many diverse segments of the economy. The totality of its reach extends to the manufacturing, service, government, and education sectors. Therefore, capturing the extent and breadth of the entire industry's

employment picture in one neat package is exceedingly difficult. Thus, in the current study, the authors replicated a previous methodology to provide comparable data. The 1985 study primarily used secondary sources from within the aviation industry. However, in compiling the 1995 study, attention was also given to some of the "soft" data areas in the 1985 study, the areas other than aviation/aerospace manufacturing and airlines. In the soft areas of general aviation, government aviation, and miscellaneous, no regular estimates of employment are released that represent the entire component. Instead, a combination of telephone interviews (completed in March 1995), and review of the World Aviation Directory, as well as other secondary sources, provided a foundation for preparing an estimate of aviation employment in those components. See Table 1 for the specific sources used.

AVIATION/AEROSPACE MANUFACTURING

While downward pressure has been felt in all areas of aviation/aerospace manufacturing, the military component has seen the largest declines due to federal budget cuts and overall Department of Defense reductions. Although civil aircraft related manufacturing employment is down in recent years, events such as the rebuilding economy and the General Aviation Revitalization Act of 1994 portend a rebound in that segment. Further reductions in the military component may, however, offset such expected increases when considering overall totals.

There is no doubt that this segment of the industry has been under the most pressure to downsize. The reduction of employment activity can best be attributed to overall sales decline. Statistics reported for 1985 indicate reduced activity in both the sales and employment sectors. Selected citations indicate the following 1985 aerospace activity:

1. Aerospace industry sales declined 3.7%.
2. Sales of civil aircraft, engines, and parts declined 9%.
3. Military aircraft, engines, and parts sales declined almost 4%.
4. Civil aircraft shipments grew by 45 aircraft, but the value of the shipments declined \$42.3 billion. This decline came solely from the commercial transport sector, where the value of shipments fell \$3 billion.
5. The number of jetliners delivered fell by 53, to 256.

Employment Data Estimates Revisited

Table 1
1995 Aviation Industry Employment Sources

AVIATION SEGMENT	SOURCE
Aviation/Aerospace Manufacturing	Aerospace Industries Association of America, 1995 Year-End Review and Forecast, December 1995
Airlines	Air Transport Association, Air Transport 1994, The Annual Report of the U.S. Scheduled Airline Industry, June 1994 World Aviation Directory, Winter 1994 Edition
General Aviation	Federal Aviation Administration, Proceedings of the Second Annual General Aviation Forecast Conference, March 1992 General Aviation Manufacturers Association (GAMA), The General Aviation Story, 1979 World Aviation Directory, Winter 1994 Edition
Government	Telephone contact with the top 50 airports (measured in passenger enplanements) Telephone contact with the Federal Aviation Administration Great Lakes Regional Office

Although there was some stability and growth from 1985 to 1989, since 1989 aerospace/aviation manufacturing employment began a decline that it has not yet recovered from.

Accordingly, aerospace industry employment also fell in similar proportions. Actual 1995 reports indicate aerospace/aviation manufacturing employment of 778,000. Compared to the 1985 estimate of 1,252,000, this segment has experienced a downward adjustment of 474,000 employees.

AIRLINES

This segment of the aviation industry has seen profound changes since the Airline Deregulation Act of 1978 (ADA). The outcome of this legislation and the industry's reaction to its anti-regulation theme has changed virtually the entire way the airline business and transportation policy are administered. Resultant industry consolidation, among other elements, in the 1980s and early 1990s resulted in widespread availability of aircraft and support equipment. This permitted new low-cost, low-fare carriers to enter and reshape the airline marketplace and consequently the workplace.

Estimates of 1995 U.S. domestic airline employment figures and their origin are:

1. Major and national passenger airlines that are members of the Air Transport Association (ATA) employed 418,473 people in 1995. The three largest airline employers--American, Delta, and United--each employ more than 70,000, with American the largest at 90,835.
2. Major, national, and regional passenger airlines that are flying turbojet or turbofan aircraft but are not members of ATA employed 19,803 in 1995.
3. Regional airlines flying largely turboprop and piston aircraft employed 40,375 people at the start of 1995. The largest regional airline in terms of employment is AMR Flagship at 3,945.
4. Air cargo carriers employed a total of 161,802 at the

Table 2
Airline Employment Estimates

AIRLINE CLASSIFICATION	1985	1995	CHANGE
Major and National Airlines (ATA members, minus Air Cargo Carriers)	291,041*	418,473	+127,432 (+43.8%)
Excluded (non-ATA Airlines)	15,138	19,803	+6,720 (+30.8%)
Regional Airlines	14,000	40,375	+26,375 (+188%)
Air Cargo Airlines	64,038	161,802	+97,764 (+152.7%)
Totals	384,217	640,453	+256,236 (+66.7%)
*Major and national airlines total from 1985 reduced by 64,038 to reflect moving Evergreen, Federal Express, Flying Tigers and Purolator Courier total to Air Cargo.			

Sources: Air Transport Association and World Aviation Directory, Winter 1994 Edition.

start of 1995. The largest, Federal Express, employs 96,000 people.

The total 1995 airline employment estimate including all of the previously mentioned components is 640,453.

Compared to the 1985 estimate of 384,217, the 1995 airline employment estimate is up 256,236 employees, or 66.7% over 1985. Each of the components of the airline employee estimate have increased over 1985 (see Table 2). Obviously, regional airlines employment, which has grown through regional airline ownership and/or marketing arrangements with major and national airlines, has seen the greatest percentage growth (188% over 10 years). Air cargo carriers also grew remarkably well since 1985, at 152.7%. This dramatic increase was partly due to the entrance of several new carriers such as United Parcel Service Airlines, plus the expansion of existing cargo carriers such as Federal Express.

The airline industry's largest employers:

1. Major and national airlines: American at 90,835, followed by United at 78,519, and Delta at 70,066.
2. Non-ATA: America West at 11,600.
3. Regional: AMR-Flagship at 3,945, followed by

AMR-Simmons at 3,158, and Continental Express (Britt) at 2,700.

4. Air cargo: Federal Express at 96,000.

GENERAL AVIATION

The general aviation industry includes a wide range of aircraft operators and aircraft source companies. Typically the general-aviation fixed base operator on an airport is thought of first as a key example of general aviation presence around the nation. However, evidence suggests that this segment of general aviation may be shrinking from as many as 4,500 such companies in the early-to-mid 1980s to 2,000 to 3,000 at

present (FAA, 1992). In reviewing the various sources of information for the 1995 estimate, companies that perform aircraft modifications, completion, and overhauls and those that are aircraft/aircraft parts distributors or suppliers, are also a big segment of the industry. The 1985 sources did not identify this as a separate segment of general aviation, which left them to be included under "sales, service" (GAMA, 1979).

In any case, the 1985 and 1995 data are included in Table 3. Although Table 3 shows an increase of nearly 100,000 employees, it is likely that the increase is due to more inclusive 1995 data rather than to growth in this segment overall. As already noted, overhaul/modification companies and aviation distributors/suppliers were not specifically included in the 1985 estimate. Finally, in the case of the agricultural, corporate flight departments, and self-employed segments of general aviation, a reduced version of the 1985 estimate was used. A reduction was applied due to the overall downsizing of the "traditional" segments of general aviation.

The largest employers:

1. Overhaul/modification company: Dyncorp at 23,000.

Employment Data Estimates Revisited

Table 3
General Aviation Employment Estimates

INDUSTRY SEGMENT	1985	1995	CHANGE
Sales, Service (including FBO's, completions-modifications-overall, and charter/commercial carriers and subcomponents)	145,000	225,578	+80,578 (+55.6%)
Agricultural	20,000	10,000	-10,000 (-50%)
Corporate Flight Departments	45,000	35,000	-10,000 (-22.2%)
Industrial/Special Uses and Distributors, Suppliers	15,000	64,313	+49,313 (+328.75%)
Self-Employed	15,000	10,000	-5,000 (-33.3%)
Totals	240,000	339,891	+99,891 (+41.6%)

Sources: General Aviation Manufacturers Association, General Aviation Story (1979), and World Aviation Directory, Winter 1994 Edition.

2. FBO/aviation services: Odgen at 14,000, followed by AMR/Combs at 5,100.

3. Distributors/suppliers: NEC America Inc. at 8,000.

**GOVERNMENT AVIATION
(EXCLUDING MILITARY)**

Government aviation employment outside the military totaled 85,389 in 1995 (see Table 4). At the federal level, the key government aviation agency is the Federal Aviation Administration, where employment is estimated at 48,000. Employment in aviation at other federal agencies is estimated at 5,000. This figure is considered conservative, considering that the U.S. Department of Defense,

Table 4
Government Aviation Employment

SEGMENT	1985	1995	CHANGE
Federal	55,873	53,000	-2,873 (-5.14%)
State	2,000	2,000	None
Local	13,147	30,389	+17,242 (+131.15%)
Totals	71,020	85,389	+14,369 (+20.23%)

Sources: Federal Aviation Administration, National Association of State Aviation Officials, and 38 of the top 50 airports in the United States.

U.S. Department of the Treasury, U.S. Department of Agriculture, and other related federal agencies operate hundreds of law enforcement, forestry, and research-related aircraft.

All 50 states now have a state aeronautics agency. Employment is estimated to have held constant at 2,000 employees, with large numbers concentrated in those states that operate airports (e.g., Alaska, Hawaii, Maryland, and Rhode Island).

Telephone calls were made to the top 50 airports in the United States. These airports were selected based on Federal Aviation Administration volume identification. A total of 38 airports reported aggregate

employment of 19,296, or an average of 507.8 employees per facility. Predicated on this high rate of response (76%) and a high positive correlation of the Pearson Product Moment, it was determined that an employment ratio existed between size and employment among these

airports. Applying this average to the rest of the top 50 renders 6,093 additional employees, or a total of 25,389 employees at the top 50 airports. An additional 5,000 employees are estimated to be at the remaining 5,000-plus airports open to the public in the United States. This renders a total of 30,389 at local airports in the United States. These figures do not consider airport service (FBO) employees, who are counted under general aviation.

The largest 1995 employers:

1. Federal: Federal Aviation Administration at 48,000.
2. State: Hawaii at 650.
3. Local: Chicago O'Hare International Airport/City of Chicago at 1,791.

MISCELLANEOUS AVIATION EMPLOYMENT

In this category are groups of employees that do not fall precisely into one of the categories already presented (see Table 5). Travel agents saw a huge increase in number since 1985, while a new category (air cargo/air freight forwarders) was added that was not specifically included in the 1985 estimate. Finally, the "related industries" total was reduced merely to reflect the author's estimate of a more realistic number for this sector. The other components, based on the author's estimate, show no change.

A key point related to the "miscellaneous" category is whether or not any (or all) of the components of this category should be included in an estimate of aviation industry employment. Also, no effort was made to establish which parts of a particular component have employment attributed to the aviation industry. However, if concern arises over all or part of a component being included in this estimate, then its employment can easily

Table 5
Miscellaneous Aviation Industry Employment

SEGMENT	1985 ESTIMATE	1995 ESTIMATE	1985-1995 CHANGE
Travel Agencies (American Society of Travel Agents estimates)	104,000	300,000	+196,000 (+188.46%)
Consultants (including construction)	10,000	10,000	None
Industry Associations	500	500	None
Aviation Educators	600	600	None
Related Industries	5,000	2,500	-2,500 (-50.00%)
Air Cargo/Air Freight Forwarders	Excluded	28,311	+28,311 (unknown %)
Totals	120,100	341,911	+221,811 (+183.69%)

Sources: American Association of Travel Agents (ASTA), Federal Aviation Administration (FAA), University Aviation Association (UAA), and the World Aviation Directory of 1994.

be subtracted from the total.

ACTIVE DUTY MILITARY

If the U.S. military aviation-related employment numbers were included, these are the estimated numbers of aviation personnel as of 1994 for all branches of the military (National Research Council, 1997):

Fixed-wing pilots	21,476
Helicopter pilots	16,410
Aircraft crews	10,758
Aircraft maintenance officers	6,412
Aircraft and aircraft-related enlisted	<u>108,699</u>
TOTAL	163,755

This number had dropped from 219,372 in 1985 due to extensive downsizing over the past decade.

OBSERVATIONS CONCERNING OVERALL AVIATION INDUSTRY EMPLOYMENT

Undoubtedly there is some good news in the overall totals presented in Table 6. Four of the six categories

Employment Data Estimates Revisited

show an increase in employment from 1985 to 1995, as does the overall aviation industry total. However, the aircraft/aerospace manufacturing employment drop of 474,000 raises concern about the future of the U.S. civil aviation industry. Although the trend in employment declines in manufacturing seem to be slowing (AIAA, 1995), the future in this area still seems cloudy. Another issue related to overall aviation industry employment totals is the use of the miscellaneous category in arriving at the grand totals. Examining the subtotals line in Table 6, which was provided to show the 1985 totals, the 1995 totals, and net change without the miscellaneous category, it can be seen that a net loss in overall aviation industry employment results. In this case, the loss in aircraft/aerospace manufacturing employment overwhelms the increases in the airline, general aviation, and government aviation categories.

The miscellaneous category presents special concerns for the true estimate of aviation employment. The classification of travel agent, the dominant classification, is of special concern. Some travel agencies are wholly devoted to the transportation aspect of air carrier business, while the vast majority are partially involved with aviation as such. Typically, travel agents book and sell space on both commercial and non-commercial carriers, but also spend a significant part of their time in non-aviation transportation-focused work. This travel involvement may consist of cruise, railroad, bus, and a host of other tour and business activities.

Developing a criterion that identifies the proportion or amount of time and headcount devoted to the aviation community is exceedingly difficult--and may be suspect--at best. Should this goal be accomplished, it somehow would have to be equated to the amount of time spent on aviation-oriented transportation as opposed to transportation in general. Because no specific formula exists to garner this information, a thumbnail sketch may

Table 6
Overall Aviation Industry Employment

AVIATION INDUSTRY	1985	1995	CHANGE	PERCENT CHANGE
Aircraft/Aerospace Manufacturing	1,252,000	778,000	-474,000	-37.9
Airlines	384,217	640,453	+256,236	+66.7
General Aviation	240,000	339,891	+99,891	+41.6
Government Aviation	71,020	85,389	+14,369	+20.23
Subtotals	1,947,237	1,843,733	-103,504	-5.3
Miscellaneous Aviation Employment	120,100	341,911	+221,811	+184.4
U.S. Military (Aviation Related)	219,372	163,755	-55,617	-25.4
GRAND TOTALS	2,286,709	2,349,399	+62,690	+2.7

be obtained by considering the amount of business supplied to air carriers.

According to Wells (1994), the importance of travel agencies as an airline marketing area has grown significantly since deregulation. In 1970, roughly 25% of the industry revenues were produced by independent travel agents. By 1985, that percentage had increased to 70%, and in 1991 had reached 80%. Trans World Airlines (1996) reported that consistent with most other airlines, 78% of all its tickets sold for travel were sold by travel agents.

Applying these rates to the totality of the agent market may provide a better evaluation of the number of agents resulting from the aviation field. Although full-service travel agents are involved in aspects of transportation outside of aviation, a large part of most agency revenues is derived from airline commissions. Thus, using the percentages described above of 80% in 1985 and 79% in the period of 1991-1996, the American Society of Travel Agents (ASTA) estimates may be whittled to 83,200 in 1985 and 237,000 in 1995.

Table 7
Overall United States Employment 1985-1995

SECTOR	1985	1995	CHANGE	PERCENT CHANGE
Total Private Sector	81,948,000	98,048,000	+16,100,000	+19.6
Goods Producing	24,765,000	24,184,000	-581,000	-2.34
Mining	890,000	566,000	-324,000	-36.4
Construction	4,765,000	5,302,000	+537,000	+11.3
Manufacturing	19,110,000	18,316,000	-784,000	-4.1
Service Producing	73,735,000	93,189,000	+19,454,000	+26.3
Transportation	5,257,000	6,251,000	+994,000	+18.9
Wholesale	5,762,000	6,393,000	+631,000	+10.9
Retail Trade	17,579,000	20,969,000	+3,390,000	+19.3
Financial/Ins/ Real Estate	6,103,000	7,001,000	+898,000	+14.7
Services	22,482,000	33,250,000	+10,768,000	+47.9
Government	16,552,000	19,325,000	+2,773,000	+16.8

Source: Bureau of Labor Statistics <http://stats.bls.gov:80/cgi/surveymos>

Unfortunately, dollar value supplied to airline revenue and the amount of work actually involved in producing such amounts do not necessarily coincide, leaving a flaw in the estimates. This delimitation left the authors with the dilemma of including ASTA's figures as representative of the industry or using a convoluted method as an assessment. As other figures provided were not questioned, those provided were used for this paper.

Aviation has evolved into one of the more resilient segments of the U.S. economic base. Accordingly, a 5.7% average industry growth rate occurred during the last 10 years. Specifically, from 1985 to 1995 employment in the industry (exclusive of military aviation) grew from 2,067,337 to 2,185,644 employees. When considering military figures, the last 10 years exhibited a positive 2.7% growth rate. In both cases, this net positive growth occurred despite massive consolidation in the air

transport, aerospace, and airframe manufacturing sectors, and despite the virtual cessation of piston-engine general aviation manufacturing activity, due in part to product-liability issues. Emerging global market dynamics and profound changes are taking place in the aviation industry. Privatization, globalization, and liberalization in the form of reduced government regulation are placing challenging demands on industry managers as they strive for improved productivity, quality, and profitability. Despite all this turmoil the industry still grows and has shown a flexible ability to maintain parity with the general Bureau of Labor Statistics (BLS) reported sectors in Table 7.

It is interesting that segments of the industry have performed much better than some of those in the general economy. The classifications of airlines, general aviation, government aviation, and miscellaneous aviation have, in general, outstripped the 10-year increases of most reported BLS sectors. Thus, despite the general downturn in the manufacturing segment of the industry and military downsizing, the industry exhibits healthy areas.

CONCLUSION

The most important conclusion to make based on the data presented in this paper is that when aviation industry employment figures are presented in aviation industry-related publications, the figures are almost always understated. For example, the total aviation industry employment figure identified in this paper (2,349,399) was generally 1.0 million or more employees

Employment Data Estimates Revisited

Table 8
Top Four Aviation Industry Employment Components
(1985-1995 Growth)

Miscellaneous Aviation	183.7%
Airlines	66.7%
General Aviation	41.6%
Government	20.2%
Total Private Sector	19.6%
Total Government	16.8%

Source: Previous Tables

than reported in three separate publications over the past year.

Second, the overall aviation industry employment figure grew by a relatively small number (62,690 jobs) from 1985 to 1995. In fact, there would have been a decline in overall aviation industry employment if the categories of miscellaneous, travel agents, and so on, had not been included in the total.

Third, the aviation industry reflects the total national economy in the sense that jobs are being redistributed from the manufacturing sector to the service sector. Therefore, even though there were tremendous job losses in aerospace/aviation manufacturing, there were offsetting employment increases in the airline and general aviation segments of the industry in the same period.

Fourth, the employment growth in four of the six primary components of the aviation industry matched or exceeded overall job growth in the economy (see Table 8).

Finally, the top five subcomponents (ranked in terms of employment growth 1985 to 1995) of aviation industry employment grew at rates far exceeding any component of the U.S. economy (see Table 9). This growth in subcomponent employment occurred for various reasons but mainly focused on (a) the restructuring of the airline industry, how it is regulated, and how services are provided to it; and (b) restructuring of the general aviation industry based on the cessation of the mass

Table 9
Top Five Subcomponents
(1985-1995 Growth)

Industrial/Special Uses and Distributors/Suppliers (Part of General Aviation)	328.75%
Travel Agencies (Aviation/Airline Proportion)	188.46%
Regional Airlines	188.0%
Air Cargo Airlines	152.7%
General Aviation Sales and Service	55.6%

Source: Previous Tables

production of piston-engine aircraft in the period, with an accompanying increase in needs for spare-parts distributors to support an aging fleet of aircraft.

RECOMMENDATIONS
FOR FURTHER RESEARCH

The data presented in this paper indicate that there is still much to learn about aviation industry employment, including the dynamics of change in industry components and subcomponent employment numbers. For example, estimates need to be improved, better founded, and/or researched more carefully in the following areas:

1. A more complete definition of the general aviation component is needed to more clearly define what is included in it. Also, estimating fixed base operator employment remains a problem because of the fluidity of that particular subcomponent. In addition, some overhaul and parts companies probably should be labeled "airline" rather than "general aviation," but cannot be labeled as such until we know more about them without further direct contact with each airport.
2. Government-related airport employment outside the top 50 is difficult to determine.
3. State-level government aviation employment is also difficult to estimate. Further research should be undertaken to precisely determine state-level aviation employment.
4. The entire miscellaneous category needs examination--what should be included as far as aviation-

related employment is concerned? Additional research concerning the exact aviation-oriented percentage of travel-agency business needs to be conducted to identify a more concise aviation-oriented employment number in this component of the industry.□

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