Executive Summaries of the Aviation Accident Study
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Executive Summaries of the Aviation Accident Study

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Foreword

From the beginning, the Institute’s research has been aimed at developing a basic understanding of how the civil justice system operates. That basic understanding, as well as attempts to evaluate how well the system is fulfilling its explicit objectives, necessarily requires careful examination of both the unique and the common features of different types of litigation. Accordingly, the ICJ has looked at such issues as patterns of litigant behavior, transaction costs, and compensation paid in different types of litigation, including automobile accidents, asbestos worker injury, products liability, and medical malpractice. This volume summarizes our detailed studies of litigation arising from another important type of litigation, commercial aviation accidents.

Two features of this research make it especially interesting. First, aviation accident suits differ in important ways from other types of liability litigation. Unlike most tort litigation, which involves one or two plaintiffs and a similar number of defendants, aviation accidents are mass torts that usually involve multiple defendants and may involve hundreds of plaintiffs. In addition, the litigants are often represented by specialized defense and plaintiffs’ attorneys who use established procedures to coordinate their work. Perhaps most important, the dispute between plaintiffs and defendants in aviation accident cases generally focuses exclusively on the issue of the appropriate level of compensation, whereas most tort litigation also involves disputes about what caused the injuries and who is liable. These differences make the current research a particularly useful point of comparison with prior ICJ studies.

Second, prior ICJ studies of particular types of litigation have focused on the amount of compensation paid and the level of transaction costs, whereas this research incorporates a new element: the plaintiff’s economic loss. The compensation and cost measures have been used to address such questions as how much plaintiffs receive on average, how the level of that compensation varies with the characteristics of individual plaintiffs, and the percentages of the total payout
that go to the plaintiffs and the lawyers, respectively. By incorporating measures of plaintiffs' actual economic loss, we can not only compare compensation paid to loss suffered, but also consider the potential implications of such comparisons for the tort system's overall performance. This represents a depth of analysis that was not possible in prior ICJ research.

The special features of aviation accident litigation also added a degree of complexity and difficulty to the analysis and to its interpretation. Indeed, the problems of dealing with these unique issues delayed the completion of the research beyond our initial schedule. One of the principal sources of complexity was the absence of a generally accepted methodology for calculating economic loss. Each state has its own statutes governing wrongful death litigation, and these statutes differ not only in computational specifics but sometimes even in the principles underlying the calculation of loss. Moreover, throughout the period covered in this research, the standards being applied by the courts to determine loss were changing. We were thus required to develop our own methodology for computing loss—a landmark effort. The resulting methodology, designed to capture the principles underlying the tort system's compensation and deterrence objectives, provides a necessary benchmark for comparing levels of loss and compensation across accidents and jurisdictions. It does not, however, necessarily correspond to the standards that were employed in particular cases in the study.

Each of the substantive volumes in this study covers a different element of aviation accident litigation. The present volume is a compendium of summaries of those separate reports. The first volume summarized herein, *Costs and Compensation Paid in Aviation Accident Litigation*, describes the general character of aviation accident litigation and compares plaintiffs' and defendants' litigation expenses with the compensation paid to the survivors of those who died in the accidents. It also compares the relative size of transaction costs in aviation accident litigation with the size of such costs in other types of litigation. The second volume, *Dispute Resolution Following Airplane Crashes*, focuses on the legal behavior of litigants and analyzes the legal and economic determinants of the litigation decisions that plaintiffs and defendants faced in the cases we examined. The third volume, *Computing Economic Loss in Cases of Wrongful Death*, reviews the underlying principles and detailed procedures used to compute the economic loss associated with individual decedents. The fourth volume, *Economic Loss and Compensation in Aviation Accidents*, describes the characteristics of the decedents and compares the compensation paid to their survivors with the levels of economic loss those
survivors suffered. In total, these studies provide a uniquely detailed picture of what happens in this particular type of litigation.

The broad scope and detail of this research raise two important issues: How applicable are these findings to other types of tort litigation? And what do they say about the operation of the tort system more generally? As prior ICJ research has demonstrated, the tort system is not homogeneous. Each type of litigation has features that shape its own distinctive patterns. But some of the features of aviation accident litigation are clearly similar to those of other litigation. Thus, the methodology we developed for calculating loss will be directly relevant to other wrongful death cases. The findings on transaction costs reflect the special way mass aviation cases are organized and will be directly relevant to other mass disaster cases involving wrongful death and multiple defendants. The study of litigant behavior examines decisions that are common to all litigants, although some of the specific features of aviation litigation will not be present in other types of cases. The comparisons of compensation and loss in the present research reflect the individual details of the cases involved in the accidents we studied. Nevertheless, the general approach of comparing loss and compensation is clearly more broadly relevant.

It is also uncertain how applicable these findings are to the system more generally. We have held the tort system up to standards derived by translating formal legal principles into objective calculations of economic loss. In these aviation death cases, there are substantial discrepancies between these standards and the actual outcomes. However, our evaluation did not account for other influences and objectives that have shaped the tort system and its processes. The operation of that system, for example, reflects a diverse and potentially conflicting range of society's moral, social, and economic standards. In addition, legislators, judges, and lawyers, not to mention defendants and plaintiffs, have diverse objectives that condition the outcomes the system produces. And the outcomes themselves reflect the complex interplay among the tort system, other compensation systems and sources, and the regulatory system.

In drawing implications from this research, careful consideration should be given to these other influences and objectives. Policymakers must consider, for example, not only how the system's performance matches up to its specific objectives, but also whether its own varied objectives might actually conflict. They also need to understand how the tort system interacts with other systems that have conflicting or complementary goals.

Kevin F. McCarthy
Director
The Institute for Civil Justice
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COSTS AND COMPENSATION PAID
IN AVIATION ACCIDENT LITIGATION

James S. Kakalik, Elizabeth M. King,
Michael Traynor, Patricia A. Ebener,
and Larry Picus

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Executive Summary

In 1985, RAND’s Institute for Civil Justice undertook a comprehensive study of aviation accident death cases. Through the cooperation of plaintiff and defense attorneys, defendants, and insurers, the RAND research staff had complete access to the detailed records of more than 2,000 cases—the entire population of U.S. airline major aviation accident death cases from 1970 to 1984. This report describes the characteristics of the decedents and the litigation, provides data on compensation paid and litigation costs, and compares the transactions costs with the amount of compensation paid for aviation accident and for other types of tort cases.

The study found that from the average total compensation of $363,000 received in the mass aviation accident cases that involved U.S. airlines between 1970 and 1984, the plaintiffs paid $72,000 in legal fees and related expenses and took home $291,000 in net compensation. Defendants’ litigation expenditures amounted to $49,000 per death. The combined litigation expenditures for both sides totaled $121,000 per death. Thus, of the total $412,000 in expenditures per death, the plaintiffs received 71 percent in net compensation, and 29 percent went for transactions costs.

OVERVIEW OF AVIATION ACCIDENT LITIGATION
Scope and Data Sources

Scope. The study included all 25 major accidents that involved U.S. airlines between 1970 and 1984. These accidents resulted in 2,228 passenger and ground deaths. Data were included on all these deaths except for 30 whose cases were still open when data collection stopped in May 1986. The study excluded U.S. airline accidents that involved relatively small aircraft (60 or fewer passenger seats) or relatively few
deaths (five or fewer). The study also excluded accidents involving only private planes.

Data Sources. The study used three kinds of data.

We collected data on each accident from the claims and accident files of insurance carriers and defense lawyers. Data included characteristics of the decedents, the claimants, the lawsuits, and the accidents; compensation data; experts’ evaluations of case worth; and defendants’ litigation expenditures. We also collected information on plaintiffs’ legal fees and related expenses whenever the files contained that information.

We supplemented the claims and accident file data with information from personal interviews with plaintiffs’ attorneys who are aviation specialists; a mail survey of a random sample of plaintiffs’ attorneys; interviews with representatives of every airline and aircraft manufacturer, the U.S. Department of Justice, every primary insurer, and the person primarily responsible for negotiating liability and damage compensation for the defendants in each accident; and published statistics on accidents.

Many claims files lacked information critical to estimating economic loss—for example, fringe benefit rates or taxes paid. We used external economic, census, and labor market sources to estimate these factors.

Characteristics of the Decedents

Air accident victims differ systematically from the U.S. population along several dimensions that should make their compensation values higher than the values associated with the death of an “average” American. The decedents in our sample were predominantly male and middle-aged. About two-thirds were employed, and their average income was twice the national average.

About 60 percent of the decedents in the sample were married, and this fact has an important influence on compensation: The law in most states provides for payment of loss to the decedents’ survivors. About 40 percent of the cases involved multiple deaths in the same family, and in only 33 percent of the cases was there a surviving spouse. Multiple-family deaths significantly reduce compensation payments under current law in most states.

1These excluded accidents resulted in 331 deaths, only 12 percent of all U.S. airline accident deaths from 1970 to 1984.
Characteristics of the Litigation

Suits Filed. The plaintiffs in airline accident cases almost always file separate claims or lawsuits for each decedent. About 90 percent of the claimants in the accidents we studied hired a lawyer. However, lawyers did not always file lawsuits on behalf of their clients. Only two-thirds of the claims resulted in lawsuits. Of these suits, more than 85 percent were settled without going to trial.

Time to Closure. The time from accident to disposition varied with the stage of closure (see Fig. 1). For example, the average time to disposition for claims settled without a lawsuit was 1.0 year. Settled lawsuits took an average of 2.5 years. And tried cases had an average time to disposition of nearly 5 years.

Multiple Defendants. Aviation accident cases usually involve multiple defendants. The most commonly named defendants are the airline, the aircraft manufacturer, the U.S. government (air traffic control), and one other organization that may have manufactured equipment for the airplane or serviced it.

However, not all of the defendants named actually pay compensation. In about one-third of the cases in this study, two defendants paid; in another third, only one paid. In all cases, the airline contributed to passenger compensation.

Specialized and Coordinated Bars. Both the plaintiff and the defense bars are quite specialized. Fourteen law firms handled approximately one-third of the plaintiff cases in our sample and about half of the cases that went to trial. The defense bar is also specialized, in part because the aviation accident insurance market is itself very concentrated. The defense is coordinated by the direct insurer of the airline, who takes the lead in negotiating with the plaintiffs on behalf of all defendants.

Causation and Liability. Defendants in air accident litigation usually do not seriously contest liability with the plaintiffs, and defendants often simply agree among themselves about how to share that liability. In about half of the accidents in our sample, there was no major liability dispute of any kind. Even when defendants fought about liability among themselves, the disputes did not usually delay payment of compensation to the plaintiffs. Either the airline’s insurer paid it, expecting to seek reimbursement later, or the defendants signed an interim contract, pending later adjustment.
Fig. 1—Time to disposition and stage of closure for aviation accident death cases

Average = 2.2 years
1970-1976 = 2.5 years
1977-1982 = 1.8 years
LEGAL ENVIRONMENT

Type of Court

About 40 percent of the deaths resulted in lawsuits filed in federal courts, 20 percent had suits filed in state courts, 1 percent had suits filed in foreign courts, and the remaining one-third did not involve lawsuits. Nearly all of the federal cases were subject to multidistrict litigation procedures, which transfer cases pending in different federal district courts to one district for consolidated pretrial proceedings.

Laws Governing Compensation

Compensation for aviation accident deaths is usually governed by state law, and all states have statutes establishing the damage principles that apply in these cases. With the exception of one state whose law is penal, all states provide for compensation of economic loss, and many also permit recovery for noneconomic loss such as pain and suffering and loss of consortium. About four-fifths of the states have some type of law that provides payment of economic loss to survivors; about one-fifth of the states have statutes in the general category of economic loss to the decedent’s estate.

Limits on Compensation

Today no state law limits total compensation for aviation deaths, although some states do limit payments for nonpecuniary loss. However, in the early years of our sample, some states had legal caps on total settlements or awards. In addition, current international treaties, such as the Warsaw Convention and the Montreal Agreement, potentially limit the maximum award to survivors of decedents who had international tickets. However, for a number of reasons (usually because some defendant in addition to the airline was liable), these treaties did not limit total compensation for three-fourths of the deaths involving Warsaw-Montreal treaty tickets.

COMPENSATION PAID

The average compensation paid for the 2,198 aviation accident passenger and ground deaths with closed cases was approximately $363,000 in 1986 value dollars.\(^2\) This totaled $798 million, or an aver-

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\(^2\)Other reports in this study present some slightly different average compensation numbers based on the 2,118 deaths for which economic loss could be estimated.
age of $32 million for each of the 25 accidents in the study. These figures include total compensation paid by all defendants for economic and noneconomic loss before subtracting legal fees and expenses. Punitive damages were not paid in any of these death cases.

Average compensation increased during the period covered by this study. During the first half (1970–1976), it was approximately $321,300; during the second half (1977–1982), it was $408,500.

As Fig. 2 shows, compensation paid varied widely across decedents. No compensation was paid for only 12 deaths (cases for which legally eligible claimants did not exist or could not be located). About one-fourth of the deaths resulted in compensation of less than $100,000. Half of the cases involved compensation of less than $179,000. The maximum compensation awarded was more than $5,000,000 per death. Only 6 percent of the cases resulted in compensation of more than $1,000,000, but these cases account for almost one-third of the compensation paid for all deaths combined.

Compensation varied with stage of closure, as Fig. 3 shows. Claims settled without a suit averaged about $256,200 in compensation. The nearly two-thirds of the cases that involved lawsuits had substantially higher compensation. Settled lawsuits averaged $387,600 in compensation, about one and one-half times as much as settled claims that did not involve lawsuits. Average compensation for cases that went to trial was approximately $599,000, nearly double the average of $339,800 for all cases that closed before trial began.

PLAINTIFFS’ LITIGATION EXPENDITURES

Contingent Fee System

The dominant fee system for plaintiffs’ attorneys is the contingent fee, in which lawyers receive a percentage of the compensation after all the plaintiff’s other legal expenses are deducted. The most common fee is about 15 to 25 percent. However, there are some variations. Lawyers may charge less if no suit is filed or if the case does not go to trial; if the case settles early; or if the lawyer is handling multiple cases for the same accident.

Data Sources

Our estimates of plaintiffs’ litigation expenditures include both legal fees and any other expenses associated with the case—for example, court filing fees and expenses for developing information about the decedent’s economic and family history. We included fees to both a
Fig. 2—Distribution of total compensation paid per death
Fig. 3—Compensation by stage of disposition (1986 dollars)
local attorney and an aviation accident specialist attorney if one was hired, as well as the fee paid to a plaintiffs’ committee if one was established for the accident. To analyze plaintiffs’ litigation expenditures, we used exact data from case files, where possible. We supplemented the file data with interviews of plaintiffs’ attorneys and mail survey data. Although we do not have data for every case, we believe that our estimates of average plaintiffs’ expenditures are reasonably accurate: Nearly all the claims were handled on a contingent fee basis, and the data from the various sources are consistent.

**Plaintiffs’ Average Expenditures**

We estimate that the average plaintiffs’ legal fees and related expenses for all the cases with lawyers were 21 percent of compensation, about $80,000 per decedent. If we include cases without lawyers, the average litigation expenditures were about $72,000 per decedent. Since we have assumed that the 215 cases without lawyers have minimal or no litigation expenses, the remainder of this discussion refers only to the cases in which there was an attorney.

**Variation in Plaintiffs’ Litigation Expenditures**

We used multivariate regression analysis to estimate the independent effects of a variety of factors on plaintiffs’ litigation expenditures. Our analysis showed that six variables are significantly related to variation in these expenditures:

- The year of the accident.
- The amount of economic loss to survivors of decedents.
- The stage at which the case was closed.
- Whether the sole counsel was a foreign attorney.
- Whether the decedent had a Warsaw-Montreal treaty ticket.
- Whether a state law limited total compensation.

**Year of the Accident.** Average plaintiffs’ litigation expenditures as a percentage of total compensation declined during the study period from an average of 24 percent during 1970–1976 to an average of 18.4 percent during 1977–1982. This is an estimated average decline of about 0.2 percent per year from 1970 to 1976 and 0.8 percent per year thereafter. The decline is statistically significant. This reduction in expenditures as a percentage of compensation has been almost exactly offset by a rise in the average compensation. Thus, for cases with lawyers, the total of plaintiffs’ litigation expenditures per case has

The aviation accident specialists we interviewed suggested several factors that might explain the downward trend in fee ratios. After about 1976, there was a trend toward early and substantial offers by defendants; liability was less likely to be contested; and competition among aviation litigation specialists for clients intensified. Whatever the causes, accidents since 1977 typically involve fees of from 15 to 25 percent; more recently, cases have fees of from 15 to 20 percent, with some quoted as low as 10 percent.

Amount of Economic Loss to Survivors. As economic loss to survivors rises, the average plaintiffs’ litigation expenditures as a percentage of compensation decline. Since the attorney’s work probably does not rise proportionately with compensation, this decline suggests that an attorney may be willing to accept a lower-percentage contingent fee on cases perceived to be of higher value.

The decline in plaintiffs’ litigation expenditures is only significant for cases with economic loss over $1 million: Litigation expenses, as a percentage of compensation, were 2.6 percentage points lower for a case with $2 million in economic loss than for a case with less than a $100,000 loss. However, although average expenditures for high-loss cases are a lower percentage of total compensation, the amount spent is much higher: The average litigation expenditures per death for cases with economic loss under $100,000 in this study were $32,000; for cases with losses over $2 million, they were $172,000.

Stage at Which the Case Was Closed. Plaintiffs’ litigation expenditures as a percentage of compensation were lower for cases without a lawsuit or a trial. If a suit was filed, average litigation expenditures per death were $92,000, more than double the amount for cases closed without suits. We estimate that filing a lawsuit entails litigation expenditures as a percentage of compensation that are 7.4 percentage points higher than the figure for cases without a lawsuit. There are a number of possible reasons for this difference. Some contingent fee contracts call for a higher percentage if the case is closed after a lawsuit is filed; some lawyers may charge a higher rate if the case remains unresolved for a year or some other time period, in which case it is more likely to be in suit. We estimate that cases that actually went to trial had litigation expenditures as a percentage of compensation that were 2.7 percentage points higher than cases that were settled. Some contingent fee contracts call for a higher fee percentage if the case is closed after trial begins, and the expenses of trial often exceed the expenses of settled cases.
Foreign Attorney as Sole Counsel. If the only attorney in the case was foreign, plaintiffs’ average litigation expenditures as a percentage of compensation were about 8 percentage points lower than those in cases involving U.S. attorneys.

Whether the Decedent Had a Warsaw-Montreal Treaty Ticket. All other factors being equal, cases in which the decedent had a Warsaw-Montreal treaty ticket had litigation expenditures as a percentage of compensation that were 2.6 percentage points lower than those without such a ticket.

Whether a State Cap on Total Compensation Applied. State limits on total compensation also affected litigation expenditures. The plaintiffs’ expenditures for these cases as a percentage of compensation were 5.5 percentage points lower than the expenditures for cases that were not subject to these caps, indicating that a ceiling on compensation may reduce the amount of work done by attorneys for some cases.

DEFENDANTS’ LITIGATION EXPENDITURES

Data Sources

We grouped defense expenditures into two categories: (1) expenses related to determining the division of liability among defendants, and (2) expenses related to determining the compensation for passengers and ground victims. The expenses data we obtained from defendants and their insurers include allocated and unallocated expenditures. Allocated expenditures are fees paid to outside defense lawyers retained for the case and any other defendant and insurer expenses that are allocated directly to a specific accident. Unallocated expenditures are the defendants’ and insurers’ in-house costs for processing and supervising the claims and litigation.

Because insurer records do not distinguish between expenditures incurred for determining liability and those incurred for determining compensation, we asked the insurance companies and lawyers who actually did the work to estimate how they divided their time and other expenses between these two activities.3

Defendants’ Average Expenditures

We estimate that all the defendants combined spent a total of $60,257,000 to resolve the issue of liability for death cases. The average was $2,410,000 for each of the 25 accidents, or $27,000 for each of the

3We excluded defense expenditures related to injuries, to on-duty crew members, and to property damage.
2,228 deaths.\textsuperscript{4} Of this total, 49 percent was spent for legal fees, 38 percent for in-house costs of defendants' and insurers' employees (including U.S. government lawyers), and 13 percent for other expenses.

Determining the \textit{compensation} for each decedent cost all the defendants combined $49,563,000, or an average of $22,000 per death case. Of this total, 55 percent was for legal fees, 29 percent was for in-house costs, and 16 percent was for other expenses.

The total expenditure for liability and compensation litigation was $109,820,000. The per-death expenditure average was $49,000. This amount is approximately 14 percent of the average $363,000 compensation per death. For both compensation and defense litigation expenditures, defendants and their insurers spent an average of $412,000 per death.

\textbf{Variation in Defendants' Litigation Expenditures}

Expenditures varied widely across the various accidents. For compensation litigation expenditures per death, this wide distribution is partly explained by the fraction of deaths in an accident that resulted in lawsuits and trials. In some accidents, many claimants filed suit and a relatively high percentage of them went to trial; in other accidents, many cases were settled without a suit. For liability litigation, a major factor in determining the distribution is whether or not there was a significant liability dispute, usually among the defendants.

Our multivariate statistical analysis, done at the accident level because data were not available at the decedent level, shows that defendants' litigation expenditures vary with the characteristics of the accident and of the litigation itself. Because of the small number of cases in this study—25 accidents in all—our statistical findings should be regarded as suggestive rather than conclusive.

Different factors influence expenditures for liability and compensation litigation:

- \textit{Liability litigation expenditures} are higher for accidents with higher economic loss.
- \textit{Compensation litigation expenditures} are higher for accidents (1) that involve a larger fraction of lawsuits, (2) that have a larger fraction of plaintiffs' attorneys who are not aviation specialists, and (3) in which the insurer directly negotiated compensation.

\textsuperscript{4}The 2,228 deaths include the 30 cases that had not closed when data collection stopped in May 1986. We include them here because liability expenditures were basically completed for these cases.
Variation in Liability Litigation Expenditures. The only statistically significant variable for predicting defendants' liability litigation expenditures for an aviation accident is the magnitude of the accident, which we measured in terms of the total economic loss to all survivors of decedents. The average defense liability litigation expenditures per accident increase from about $500,000 for accidents with relatively low economic loss to survivors (less than $25 million) to over $9 million for accidents with $100 million or more in economic loss. If all other factors affecting these expenditures are equal, doubling the total economic loss for an accident increases defense liability litigation expenditures by 35 percent. This finding suggests that the larger the total amount of compensation at stake, the larger the amount the defendants will invest in disputing liability.

Variation in Compensation Litigation Expenditures. Expenses for compensation litigation are significantly influenced by (1) whether a lawsuit is filed, (2) whether an aviation accident specialist plaintiffs' attorney is used, and (3) whether the insurer negotiated the compensation.

Some claimants settle their claims without filing suit. In seven accidents in this study, more than half the claimants chose to settle without suit. In contrast, in 10 other accidents, fewer than one-fourth of the claimants settled without filing a suit. In our sample, the higher the percentage of cases that settled without a suit, the lower the compensation litigation expenditures per death.

The filing of a lawsuit increases defense expenses because there is more legal work to be done if a suit is involved and because a suit generally connotes a higher level of dispute among the parties. However, we found that if the fraction of people who file a lawsuit increases from 50 percent to 75 percent, then the average defense expenditures for compensation litigation per death increase by a factor of more than two. This suggests that there were some fundamental differences in litigation behavior by plaintiffs' and defendants' attorneys in accidents with a relatively small fraction of lawsuits.

We identified the 14 plaintiffs' law firms in the United States that handled the most cases in the accidents studied. We found that when the fraction of cases handled by one of these aviation specialists doubles, for example, from 25 percent to 50 percent, the compensation expenditures per death are cut in half. This decline may be due to the fact that these specialist plaintiffs' attorneys and defense attorneys know each other, have worked together on prior accidents, and thus know what to expect of each other.

In 16 of the accidents, the insurer's employees conducted compensation negotiations directly. In these accidents, average expenditures for
defense compensation litigation were approximately $25,000. In the other 10 accidents, the insurers, by policy, delegated the primary responsibility for conducting negotiations to outside defense lawyers. When outside defense lawyers were primarily responsible, the average defense compensation litigation expenditures per death were lower ($15,500). Holding all other factors constant, the policy of having the insurer negotiate compensation increases the defense compensation litigation expenditures by more than 100 percent. The reason appears to be that even though the insurer was actually conducting the negotiations, it still utilized outside counsel extensively.

A COMPARISON OF COMPENSATION AND COSTS FOR AIR ACCIDENTS AND OTHER TORTS

Central to the debate about the tort system is the issue of whether its transactions costs are reasonable in relation to the compensation provided. We cannot answer that question definitively even for air accident litigation because we do not have the data to compare the current tort system with either revisions to it or alternative systems that might provide similar benefits. However, we can shed some light on the issue by comparing costs and compensation for air accident litigation with the costs and compensation for other torts.

Two previous ICJ studies of transaction costs provide the available basis for comparison: (1) a study of costs and compensation for all tort litigation concluded in 1985 and (2) a study of costs and compensation in asbestos worker injury litigation from 1980 to 1982. The first study provides a benchmark that reflects the broad range of tort litigation, much of which involves modest injuries. The study of asbestos worker injury suits provides what many regard as an upper bound on transaction costs relative to compensation, reflecting the complexities of liability disputes and loss calculations in toxic tort litigation.

We summarize the comparisons in Fig. 4, which compares net compensation in the average tort, air accident, and asbestos case.

Average Tort Case. In 1985, about 866,000 tort lawsuits closed in courts of general jurisdiction. In the average tort case, defendants paid about $37,300 in 1986 value dollars, of which $18,700 (50 percent) was net compensation to the plaintiffs and $18,600 (50 percent) was for litigation expenditures for both sides combined.

Fig. 4—Comparison of litigation expenditures and compensation per case for aviation accident, asbestos, and all tort cases (1986 dollars)

(Numbers may not sum exactly to totals due to rounding)
Air Accident Cases. With an average of fewer than 200 cases per year, U.S. airline major accident cases are only a small fraction of the total tort caseload. The average air accident death case resulted in $412,233 in payments by defendants, of which 71 percent ($291,170) was net compensation to the plaintiffs. The other 29 percent ($121,063) covered total litigation expenditures for both sides.

Asbestos Cases. An average of over 5,000 asbestos claims are now filed per year. In the average case closed in 1980–1982, defendants paid $123,400 in 1986 value dollars. Plaintiffs received $47,600 (39 percent) in net compensation, and $75,800 (61 percent) was used for litigation expenditures for both sides combined. We do not have data for more recent asbestos case closures, and they may differ.

Conclusion. Airline accident litigation has a lower ratio of transactions costs to total expenditures than tort litigation in general. As a percentage of total outlays, average transactions costs in aviation cases are only 29 percent, about half the average in all tort cases combined (50 percent) and in asbestos cases (61 percent). On the other hand, aviation accident cases have higher average transactions costs in absolute dollar terms ($121,000) than the average tort case ($19,000) or the average asbestos case ($76,000).

Why are the transactions costs as a percentage of compensation substantially lower for airline accident litigation than they are for all tort litigation combined and for asbestos litigation? We cannot answer this question conclusively; however, we can offer some hypotheses. First, in aviation accident cases, a unified defense is led by the airline’s insurer. Second, defendants agree among themselves as to the apportionment of liability in many accidents and often have no significant contest over liability with plaintiffs. Third, because air accident death cases are relatively high-value cases and defense litigation expenditures do not increase proportionately with the amount of compensation at stake in a case, defense litigation expenditures in air accident cases tend to be a lower percentage of the compensation paid. Fourth, many of these cases are settled without a lawsuit. Fifth, experienced aviation accident specialist attorneys often work on these cases, and the plaintiffs’ lawyers often use a committee to coordinate work on an accident. Sixth, the relatively high value of the air cases and the fact that nearly every case results in payment of compensation make it possible for plaintiffs’ lawyers to charge a substantially reduced contingent fee percentage and still make a reasonable income. And finally, competition among plaintiffs’ lawyers for clients may have put downward pressure on the contingent fee percentage.

Why are the transactions costs substantially higher in aviation accident litigation than they are for all tort litigation combined and for
asbestos litigation? Again, we can only offer hypotheses. The aviation accident cases in our study involve wrongful death; thus, compared with the typical tort case involving a much less serious injury, air cases may be more costly to prepare and to value. Second, air accident cases usually involve multiple defendants. Although defendants have increasingly shown a unified front to plaintiffs, disputes among defendants have resulted in average defense liability litigation costs per death that are more than the defense expenditures to resolve the issue of the amount of compensation per death. What is at stake in these liability disputes is not only who pays compensation but also the market-related future of airlines, airplane manufacturers, and other defendants. Third, higher-value cases result in higher plaintiffs' litigation expenditures under the contingency fee system. Fourth, the higher compensation at stake in the litigation process may lead to larger transactions costs as both sides work to protect their interests.
DISPUTE RESOLUTION FOLLOWING AIRPLANE CRASHES

Elizabeth M. King, James P. Smith

R-3585-ICJ
Executive Summary

This report summarizes results of legal actions that claimants pursued to recover their losses in major aviation accidents. As in other wrongful death cases, surviving relatives of aviation accident victims can decide to file a claim, settle, or pursue a lawsuit in court. The amount of compensation claimants received differs among those who settled, those who sued but did not go to trial, and those who went to trial.

Of the 2,113 cases for which we have an estimate of economic loss, all but two filed claims. Of those who filed claims, 35 percent settled without filing lawsuits. Of the 1,371 cases for which a suit was filed, 86 percent settled before going to trial and 14 percent went to trial. Thus, most aviation accident cases are resolved with claimants settling at various stages of the litigation process. Both claimants and defendants in aviation accidents have an incentive to settle early, because litigation, especially if it proceeds to trial, is very expensive.

A key determinant of litigant action in our theoretical model and in practice is the size of the loss associated with each death. Loss to survivors was much higher for cases resolved further along in the litigation process than for those cases settled out of court without a lawsuit. The mean loss to survivors was smallest for cases that settled prior to a lawsuit ($56,237) and highest for those that proceeded to trial ($1,408,293). Almost 40 percent of the cases that went to trial had a loss to survivors of over $1 million.

Why some cases settle early and others do not is the central question this report addresses.

THE LITIGATION MODEL

A common model was used for analyzing why parties decide to settle or litigate. The point at which disputants settle depends on several factors that underlie their implicit benefit-cost calculation. Disputants must weigh the expected gain of pursuing the claim against the
probable costs of such actions. If the expected gain from litigation exceeds its total cost, a claimant is likely to sue.

This simple model yields important implications about the determinants of litigant behavior. It is thus possible to examine the influence of specific characteristics of the decedent, claimants, defendants, and the accident on litigation activity. These characteristics affect behavior through the expected court award, litigation costs, and the settlement offer from defendants.

The model's most important implication is that litigation becomes more likely as the stakes at risk in the negotiations increase. The best measure of the stakes is the size of economic loss to survivors. Holding litigation costs constant, cases involving larger economic losses are more likely to litigate.

Litigation costs also affect the propensity of settlement. Higher plaintiff litigation costs reduce the plaintiff's "ask," and larger defendant litigation costs increase the defendant's settlement offer. An increase in litigation costs for either side makes a settlement more likely. Because litigation costs are so much larger for trials than for lawsuits, a smaller fraction of all lawsuits will go to trial. Higher litigation costs raise the threshold of economic loss required to make a trial worthwhile.

Another implication of the model reflects the commonsense notion that only a disagreement among contesting parties produces litigation. This argument suggests that those components of loss that are most difficult for both parties to evaluate increase the likelihood of litigation. In addition, when the rules of the tort system are in flux, as they were increasingly during the period of this study, litigation and trials become more commonplace because the expectations of the contesting parties start to diverge.

This model applies most readily to torts where there is a single plaintiff and a single defendant. Air accident litigation differs from the usual tort case in that there are multiple plaintiffs and usually also multiple defendants. To some extent, defendants devise a strategy common to all plaintiffs. In addition, there are often substantial defendant litigation costs that are specific to the accident, so that the marginal cost to a defendant of litigation against an individual plaintiff may be small.

The immediate implication of these common factors is that there should be accident-level effects. That is, some accidents will have many suits and others few for reasons not fully explained by individual characteristics of the victims and their claimants.

The results of empirical estimates of the determinants of litigant behavior are summarized below. Four sets of variables potentially
determine the probability of filing a suit, the probability of going to trial, and the duration of time to close of the case. These are:

- Characteristics of decedents.
- Characteristics of plaintiffs.
- Characteristics of defendants and accidents.
- Characteristics of the legal environment.

CHARACTERISTICS OF DECEDENTS

Size of Loss to Survivors. The central implication of our theoretical model was that cases with large losses to survivors are more likely to litigate. Our empirical results confirm this: Claims involving larger losses are more likely to result in lawsuits, to go to trial, and to take longer to settle. A 1 percent increase in loss to survivors increases the probability of a suit by 4 percentage points, the probability of a trial by 1.7 percentage points, and the length of time to resolve a case by almost 9 percentage points. The consistency of this finding across all litigant outcomes constitutes strong evidence about the importance of the stakes in determining which cases make greater demands on the legal system.

In addition, only claims involving large losses are likely to go to trial. For less than $2 million, we find no statistically significant effect of loss on the probability of a trial. When loss is more than $2 million, the probability of going to trial increases rapidly.

Larger losses lengthen the time to resolution. The duration of cases rises sharply for each percentage increase in loss up to $300,000, but that duration remains fairly constant from there up to $1 million. For cases with loss to survivors over $1 million, the effect of loss becomes much larger; time to closure lengthens by about 27 percent for every 100 percent rise in losses over $1 million, and by 29 percent for every 100 percent increase in loss over $2 million.

Sex and Citizenship. The fractions of men and foreign citizens with lawsuits suggest that these groups might be more likely to sue. However, once we control for other variables, there are no statistically significant differences in any dimension of litigation—suit, trial, or duration—between American men and women. Similarly, after we control for other covariates, there are no statistically significant differences by citizenship in the probability of filing a suit or going to trial. Cases of foreign males were resolved more quickly and foreign women less quickly than those of U.S. males.

Health. Theoretically, the decedent's health at the time of death should influence the behavior of litigants in two potentially conflicting
ways. First, if the decedent had a real and severe health problem, the value of loss should be lowered by reducing either life expectancy or work effort. But health problems are strongly contested between defendants and claimants. Our theoretical model demonstrated that disagreements on an element of compensation led to lawsuits and trials.

The decedent’s health status persistently affects litigant behavior across all dimensions. Controlling for whether health conditions were reported, cases in which the decedent was in poor health took 25 percent longer to close than cases in which the decedent was reported to be in good health. Similarly, poor health increased the probability of a suit by 20 percentage points and the probability of a trial by 4 percentage points. Much of the effect of poor health on trials stems from the larger pool of suits it encourages. Conditional on filing a suit, there is no statistically significant effect on the probability of a trial.

We interpret these results as reflecting a divergence in the assessment by defendants and claimants of how poor health should be incorporated into their loss calculations. Uncertainty about how the court would rule in such cases probably makes proceeding to litigation more attractive.

Temporary Survival Following the Accident. Theoretically, cases of victims who survive temporarily after an accident—most such survivors live for only a few hours—should be less likely to settle. In states that allow recovery for pain and suffering, the size of the loss increases, as do the stakes in the negotiations. There should be added uncertainty in the way either party assesses the value of this component of loss, partly because of conflict of law disputes. Uncertainty and disagreement raise the prospects of litigation. Our results support this theory. When the victim temporarily survived after the accident, the time to closure increased by 36 percent, the probability of a suit increased by 10 percent, and the likelihood of a trial increased by 16 percent, when we condition on a lawsuit being filed. The effect on the probability of a trial is particularly large. Indeed, those deaths where the victims temporarily survived the crash are among those most likely to proceed to trial.

CHARACTERISTICS OF PLAINTIFFS

Family Characteristics. Survivors suffer noneconomic loss, for which we have no direct measure. To capture its effect, we include variables indicating whether a spouse survived the decedent, whether a
minor child survived the decedent, and whether the primary beneficiary of a deceased minor child was a parent. The value of lost love, affection, and consortium are most likely to be awarded when the relationship between the decedent and the claimant involved one of these close relationships.

Our results show:

- A surviving spouse has no effect on litigant behavior.
- A surviving minor child has mixed effects on litigant behavior. The probability of a suit increases by 8 percentage points, but there is no effect on trials. There is a positive effect on duration to closure, but with a low t-statistic.
- When the decedent is a minor child of a surviving parent, litigation activity increases substantially. Although there is no effect on the probability of a suit, all other dimensions of litigant behavior are strongly affected. The number of days required to close a case increases by 20 percent (136 days evaluated at the mean). Much of this time results from the added likelihood of a trial, which rises by 7 percentage points.

**Number of Family Members Killed.** It is the total value of the stakes that matters, so multiple family deaths should theoretically increase the likelihood of litigation—and 40 percent of decedents died with a relative. We included a variable for the number of other family members who died in the crash because there is often a single suit for multiple family deaths.

Our results show that multiple family deaths promote lawsuits and lengthen the time required to close a case. An additional death in the family increases duration by 15 percent and the probability of a lawsuit by 6 percent. There is no effect on the probability of a trial. Small-loss cases in particular are more likely to be litigated because they are combined with other, larger losses in the same family. To the extent that these multiple family deaths are treated together, multiple deaths raise the total loss and hence increase the likelihood of a suit.

**Number of Claimants.** Because of possible economies of scale in the discovery process and other preparations for trial, having multiple claimants should lower the cost of litigation per claimant. If we control for the value of loss, having multiple claimants should reduce the probability of settling and raise the likelihood of pursuing the case to verdict. However, we found that the number of claimants had no statistically significant effect on filing a suit, going to trial, or time to close a case.
Age of Primary Beneficiary. The age of the primary beneficiary should influence litigation, especially when the primary beneficiary is elderly. Our results show that cases with beneficiaries over 70 years of age were 6 percentage points more likely to settle without a lawsuit than cases with younger beneficiaries.

The age of the decedent's primary beneficiary had a significant effect on the length of time to closure. If the claimant is 60 to 69 years of age, duration to closure is 12 percent shorter; and if the claimant is 70 years of age or older, time to closure is 22 percent shorter than for our control group of prime-age beneficiaries. Because of their own age and mortality, these elderly beneficiaries do not want settlement negotiations to drag on.

Wealth of Primary Beneficiary. Litigation can be very expensive, and plaintiffs have very different abilities to finance litigation. Plaintiffs with very limited resources should theoretically be reluctant to take on the expenses of a suit and especially of a trial. Even with the widespread use of the contingency fee system, the plaintiff's wealth may be an indicator of his or her ability to manage financially during lengthy litigation.

Our results reveal no statistically significant effect of plaintiff's wealth on the likelihood of a suit or on the duration of time to closure. However, wealthy plaintiffs are more likely to go to trial. Because trials are an order of magnitude more expensive than lawsuits, the influence of wealth on trials only is understandable.

CHARACTERISTICS OF DEFENDANTS AND ACCIDENTS

Early Communication. Two-thirds of the claimants in this study were reported to receive early communication about a settlement offer from the defendants. Our results show that early defendant communication with claimants strongly deters lawsuits. Claimants were 25 percentage points less likely to file a lawsuit when early contact was a policy than when it was not.

If defendants have a policy of making early contact, time to closure is also substantially reduced. Early communication about a settlement offer to claimants reduced the time to resolution by 36 percent.

Although this contact policy deterred lawsuits, it did not affect the probability that a case would go to trial. Indeed, the probability of a trial conditional on a lawsuit is weakly positive, with a low t-statistic. The effect of this defendant strategy was to remove lawsuits that were least likely to go to trial in any case.
More Than One Defendant Paying Damages. Airline accidents generally have more than a single defendant. Our variable measures whether more than one defendant paid compensatory damages in the accident. Because the airline always pays damages, the other payor would typically be the aircraft manufacturer or a government agency. This variable is important because the law treats compensatory damages differently for defendants other than airlines. For example, only the airline's compensatory damages are limited by the Montreal Agreement; therefore, damages paid for internationally ticketed passengers may be higher when there is more than one paying defendant.

This variable, in isolation, has no effect on lawsuits and trials, but it shortens the duration for resolving a case.

Total Loss in Accident. We included two variables to measure total loss in the accident: the mean loss per victim and the total number of deaths. Defendants are concerned not only with the damage award of an individual passenger but also with the size of the total damages they might pay. Litigation should thus be more likely the larger the total stakes become.

Although the effect of mean loss per victim to survivors is only marginally significant to the probability of a suit, an increase raises the probability of a trial and the duration of time to closure. A 1 percent increase in mean loss per victim increases the probability of a trial by 4 percentage points (6 percentage points controlling for lawsuits) and the time required to close a case by 11 percent. These effects are consistent with the implications of our theoretical framework. Larger losses, for either the individual or the accident as a whole, raise the likelihood of litigation.

In addition, accident size (number of deaths) has no effect on the propensity to sue or to go to trial by any individual claimant. This result prevails whether we control for the fraction of suits in the accident or not, suggesting that much of the delay is due to the processing of more cases in larger accidents. The size of the accident does not change the number of suits or trials, but it does prolong the average length of time it takes to deal with the typical case. In this study, an increase in the number of deaths raised the total stakes, and it also raised the total costs associated with the litigation.

Characteristics of the Legal Environment

Limits on Recovery. In the early years of our sample of accidents, some states maintained limits on the size of the award. Two states where crashes occurred during this period—Massachusetts and
West Virginia—had caps on recovery. In those crashes, there were fewer suits and the cases took less time to resolve. However, within these crashes we can detect little difference in the behavior of plaintiffs when the loss is greater or less than the stated limit.

Many foreign and American passengers for whom compensation was awarded were holding international tickets covered by treaties that potentially limit compensation (i.e., Warsaw-Montreal treaty tickets), so their actual compensation was less than our computed loss to survivors. Testing for the effects of these international treaties is important because 40 percent of the passengers had such tickets. Such tests are problematic for two reasons. First, these treaties only limit recovery from the airline; compensatory damages from the manufacturer or other defendants are not covered. Second, the effect of the cap depends on the value of the loss. For example, for passengers with calculated losses less than the $75,000 limit, these limits are redundant. The greater the disparity between our calculated loss to survivors and the treaty limit of $75,000, the greater the potential effect of the treaty on compensation awarded.

With these two problems in mind, we tested for treaty effects with the combination of two variables. We found that having only one defendant has a considerable effect on litigation of ticket holders. This influence grows with the size of economic loss. In cases where the treaty has the largest effect on reducing compensation below real loss, the treaty limit increases the level of litigation activity. When there is more than one defendant, compensatory damages of international ticket holders may not be limited, because the limit applies only to the airline. These “uncovered” internationally ticketed passengers behave little differently from other passengers in litigant actions.

Time Period. We examined whether there have been any changes in litigant behavior over time. Although the probability of filing a suit has increased in recent years, there has been no consistent time-series effect on the probability of going to trial or on time to close a case.

Our empirical findings concerning factors that determine litigation activity following air crashes are summarized in the table on p. 31.

CHARACTERISTICS OF LAWSUITS

We examined the association of certain characteristics of lawsuits with likelihood of a trial and time to closure. We found that filing in federal court had no relationship with going to trial but federal cases took less time to resolve. Cases in multidistrict litigation were less likely to go to trial but took longer to resolve. When plaintiffs used
SUMMARY OF FACTORS DETERMINING LITIGANT BEHAVIOR OF CLAIMANTS

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<th>Characteristics of Decedents</th>
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<td>Filing Suit</td>
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<td>Higher losses to survivors</td>
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<td>Reported health information</td>
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<td>Survived accident</td>
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<tr>
<td>Member of military</td>
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Characteristics of Plaintiffs

| Family characteristics                           |            |                |
|--------------------------------------------------|------------|
| Surviving spouse                                 | *          | *              |
| Surviving minor child                            | +          | *              |
| Parent of minor deceased child                   | *          | +              |
| Multiple family deaths                           | +          | *              |
| Multiple claimants                                | *          | *              |
| Higher age of primary beneficiary                | -          | *              |
| Higher wealth of primary beneficiary             | *          | +              |

Characteristics of Defendants and Accidents

|                                                    |            |                |
|----------------------------------------------------|------------|
| More than one defendant paying damages             | -          | *              |
| Early communication                                | -          | *              |
| Total loss in accident                             | +          | +              |
| Higher mean loss per victim                        | +          | *              |
| Higher number of deaths per accident               | *          | *              |
| Fraction sued in accident                         | +          | +              |

Characteristics of the Legal Environment

|                                                    |            |                |
|----------------------------------------------------|------------|
| State limit on recovery                            | -          | -              |
| International treaty limit on recovery             | -          | -              |
| One defendant (covered)                            |            |                |
| Small loss                                         | *          | *              |
| Large loss                                         | +          | +              |
| Multiple defendants (uncovered)                    | *          | *              |
| Small loss                                         | *          | *              |
| Large loss                                         | *          | *              |
| More recent time period                            | +          | *              |

+ = Increase  - = Decrease  * = No Effect
specialized attorneys, trials were more likely but took the same time as other cases to be resolved. Where there were more defendants, trials were more likely, but the number of defendants had no effect on time to closure.

Although we could determine how these variables correlated with litigant outcomes, we could not determine causality. To determine their causal role, we would have to model their effects separately. We cannot infer their effects on outcomes simply by including them as additional covariates in our models. There are two reasons for this. First, unlike the other variables, these are not exogenous—that is, they are not givens, such as poor health or economic loss, which are beyond the litigants' control. In part, these variables reflect how litigants are responding to the givens in a case. For example, we cannot infer that specialized lawyers encourage trials. In fact, plaintiffs may hire a specialized lawyer because they recognize the complexity of a case and its greater likelihood of going to trial. Second, the sample involved in these estimates is conditioned on the decision to file a suit, which is one of the key litigant outcome decisions in itself. Thus, the other variables determining that choice make this sample different from the larger case population, precluding inferences about the population-wide effects of these variables.
COMPUTING ECONOMIC LOSS IN CASES OF WRONGFUL DEATH

Elizabeth M. King, James P. Smith

R-3549-ICJ
Executive Summary

Although every state has its own statutes governing wrongful death litigation, the general objectives of the tort system require that tortfeasors make some compensation for the value of life lost. Consequently, the system's success depends heavily on how accurately that value can be calculated. Clearly, some elements that make life valuable cannot be quantified, and survivors can hardly be compensated for their loss. However, settlement negotiations and court awards operate on the assumption that the economic loss resulting from an individual's death can be reasonably calculated. Conceptually, that assumption is justified, but in practice, there is no accepted standard for calculating economic loss in wrongful death cases. Moreover, many of the existing methods are deficient, and some assumptions held by expert witnesses have been inconsistent with scientific principles of economics.

PURPOSE OF THIS STUDY

Our purpose was to develop a methodology that overcomes these deficiencies and improves the means for accurately calculating the economic loss associated with a death. This volume discusses the principles informing the methodology and describes the methods for calculating the major elements of full economic loss and loss to survivors (defined below). The principles involved are similar to those in any tort case involving wrongful death. Moreover, many components of this methodology are equally relevant to damage estimates in personal injury cases. In this Executive Summary, we discuss the rationale for the individual elements of the methodology, focusing on the ways our methods differ from standard procedures.
CONCEPTUAL ISSUES AND ELEMENTS OF 
THE KING-SMITH METHODOLOGY

Although calculations of economic loss can be based on one of 
several conceptual models, we have chosen the human capital (or lost 
economic output) approach, primarily because it dominates actual li-
gitation. Thus, adopting another conceptual model would make the 
methodology irrelevant to current policies and practices of the tort sys-
tem. In this conceptual model, economic loss is the value of the 
decedent's lost future productivity, market and nonmarket.

Given this conceptual model, economists would generally agree on 
the elements involved in calculating full economic loss and loss to sur-
vivors: Full economic loss is the sum of the discounted value of present 
and future market and nonmarket economic losses. Market loss is the 
value of decedents' lost future earnings. Nonmarket loss represents the 
present and future value of goods and services decedents would have 
produced in the home. To determine future earnings, it is necessary to 
estimate future wage rates, including rates of salary growth and the 
worklife discount—that is, the probable amount of time the decedent 
would have worked in the future.

Estimating loss to survivors involves two adjustments to the calcula-
tion for full economic loss. Where loss to survivors is the legal death 
damage principal, the objective is ensuring that their economic situa-
tion is no worse than it would have been if the death had not occurred. 
Thus, the decedent's personal consumption must be deducted because it 
would not have accrued to survivors anyway. Taxes must also be con-
sidered because dependents would have benefited only from the 
individual's after-tax income and because beneficiaries will have to pay 
taxes on interest from the compensation award.

Based on these premises, our methodology includes seven elements: 
(1) base-year incomes, (2) salary growth, (3) worklife discounts, (4) 
nonmarket loss, (5) personal consumption offset, (6) taxes, and (7) 
discount rates.

Base-Year Income

Base-year income is a key variable in calculating economic loss in 
wrongful death litigation. For full economic loss, base-year income 
indexes the value of the initial output that decedents contributed to the 
economy. For loss to survivors, it is a major determinant of the surviving 
dependents' living standard. It is also a major element in calculating 
salary growth and nonmarket loss.
For calculations of both kinds of loss, base-year incomes must include not only decedents’ regular salaries but also their fringe benefits, which provide for health insurance, retirement, etc., and must be considered in compensation. We used generally accepted methods for calculating fringe benefits and for imputing them when data were unavailable for individual decedents. Base-year incomes must also include any other regular second-job incomes, bonuses, or commissions that decedents might have earned.

Our methodology distinguishes between potential and expected base-year incomes and calculates both. Potential income is what decedents could have earned if they had worked full time in the labor market. Expected income is what they would actually have earned in the accident year. This important distinction recognizes that, for various reasons, most people do not choose to realize their full earning capacity. Consequently, calculating potential income alone would overestimate not only base-year income but future earnings as well. For our calculations, expected income equals potential earnings multiplied by the fraction of the year that decedents would have worked.

When income information is missing, it is necessary to impute decedent incomes based on external sources of information about what similar workers earn. Similarity is determined by such demographic attributes as sex, race, age, education, occupation, and citizenship. However, if the decedents do not represent a random sample of the population of people with similar demographic attributes, imputation may be biased by income selectivity: That is, it may overestimate or underestimate incomes roughly in proportion to the sample’s difference from the “average.” This proved to be a problem in our sample.

We had to impute incomes for 45 percent of the airline decedents, through regressions using data from the appropriate years of U.S. Current Population Surveys (CPS). Although the imputed salaries conform to well-established empirical regularities in the labor-market wage structure, the results for the whole sample led us to suspect selectivity bias. Those results showed that relative to the typical American worker, the air-death victims represent an economic elite. Not only were a much higher percentage of them (than of the general population) in professional occupation brackets, but within those brackets, they tended to earn more. Many of the decedents with missing income information were represented in the higher-paying occupations, but our algorithm consistently imputed incomes for them that were much lower than for those whose earnings we knew.

The skewed distribution of incomes in our sample led us to suspect that the imputation algorithm might systematically underestimate the incomes of the decedents. We conducted an experiment to test this
suspicion: We treated the decedents for whom we had income information as though that information were missing and used the assignment algorithm to "impute" incomes for them. On average, the actual incomes of these decedents are 80 percent larger than the incomes we assigned. These results suggest how important it is to have accurate salary information for wrongful death actions and, where that is impossible, to anticipate the problem of bias in imputation.

Salary Growth

If the decedents had survived, it is unlikely that their earnings would have remained at the base-year income levels. Thus, estimations of economic loss must include projections of future salary growth. Our methodology models future salary growth as the sum of three components: economywide wage growth, life-cycle salary growth, and individual-specific wage growth.

General economic growth must be considered in these calculations because of its effect on wages, independent of workers' age and education. Estimating this effect depends on projecting how much economic expansion has affected wage growth in the past. To allow for the sharp reversals in U.S. economic performance, we take a long-term view, using growth rates in white-male incomes for 1940 to 1980. The expansion rate over those years is 2.0487 percent per year. However, to project future salaries of decedents, we have used a rate of 1.9029, to adjust for the 21 percent of 1940-1980 growth that resulted from workers' increasing education levels. Rising education in each new worker cohort will no doubt result in rising future wage levels. This effect must be considered in salary growth estimations, because it will not enhance the income prospects of workers who are already in the labor force and have fixed education levels.

Life-cycle salary growth enters into the calculation because workers' salaries grow as they become more experienced and gain seniority on the job; but the growth pattern is not regular, nor is it similar for all subgroups. Research has consistently shown that men and women have very different rates of wage growth. Consequently, we estimate separate life-cycle earnings profiles for the sexes.

For men, we used data from the CPS (over a period roughly corresponding to the airline crashes) in regressions to assign the salary growth an individual could have expected at each of his subsequent ages. The salary-age relationship we estimated for men equated another year of age with another year of experience in the labor market, and our results followed the widely documented inverted "u" shape of salary growth. However, for women, another year of age does
not necessarily equal another year of experience in the work force, largely because many women still postpone or interrupt careers to raise children.

To estimate women's salary growth, one must know how much additional labor force experience they typically accumulate for each year of age. We used a model developed by Smith and Ward\(^1\) to calculate that relationship at each age for the years 1968–1985. Other variables in the equation came from the CPS for those years. The estimation of female salary growth also requires taking a woman's actual experience level into account. Where that information is missing, the method relies on imputing to a decedent the average labor force experience of women her age and employment status in the accident year.

*Wage growth specific to individuals* is also one of our components for calculating salary growth, because not all people with the same education, age, or experience get similar salaries or increases. The income selectivity bias for the airline sample suggested how large differences from the “average” could be. However, computing individually determined wage growth requires more than one year of salary information. Otherwise, temporary and unrepresentative salary actions may be extrapolated into the future.

We developed a statistical model for computing individually determined salary growth, which we were able to test because the airline claims files contained at least two years of salary history for 30 percent of the decedents. The model meets two important criteria for these calculations: It measures how much of the observed salary change in the files represented permanent differences in the decedents' salary prospects and how much was statistical noise. It also places greater confidence on the decedents' projected salary growth when we have data on salary history for many years. The results support the hypothesis that airline passengers would have anticipated larger salary increases than the “average” person with similar characteristics. Thus, they indicate the importance of this component for estimating salary growth in economic loss calculations.

**Worklife Discounts**

Calculation of future earnings involves not only base-year incomes and salary growth but worklife discounts—that is, an adjustment for the individual’s likelihood of working in all future years. That likelihood can be quantitatively predicted only on the basis of employment

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status at the time of death. However, the predictive relationship between present and future employment differs for men and women. Therefore, we developed different models for calculating male and female worklife discounts.

For men, we used the standard demographic increment-decrement model to forecast labor-force behavior. This model is a "two-state, one-period" Markov in which people can be either in or out of the labor force at any given period, but can change employment status from period to period. The "one-period" designation assumes that the probability of working this year depends only on whether or not a person worked last year, not on any prior work history. Our model for male worklife discounts explicitly incorporates the relationship between current work status and year-by-year probabilities of future employment.

Increment-decrement models are poor predictors of women's future labor-force behavior for two reasons: First, the labor-force transition rates are based on cross-sectional data. Thus, they fail to capture the rapid, sustained increases in women's labor-force participation, and underestimate future labor-force participation, especially for younger women. Second, the models' one-period assumption makes them unable to accommodate the large differences for women between probable accumulated experience of current workers and nonworkers.

The "one-period" assumption causes considerable labor-force turnover in the model, making the expected labor-force participation of workers and nonworkers very similar. For men, this is not a major problem. Because 95 percent of them will finally be in the labor market, the differences for male current workers and nonworkers actually are small. For women, the reality is different. Women who are working tend to stay in the labor force, while housewives persistently remain out of it.

For estimating women's worklife discounts, we developed an alternative approach based on the work of Smith and Ward. Their model's essential innovation is that it incorporates population heterogeneity, allowing it to capture women's tendency to remain in or out of the workforce for extended periods. We demonstrated the relative merits of the increment-decrement and Smith-Ward models by using them to calculate retrospective experiences of women and comparing the results to the actual experience. The Smith-Ward model more closely replicates the past work experience of currently working and nonworking women.
Nonmarket Loss

People engage in a range of productive activities outside the formal labor market—e.g., cooking, shopping, caring for children, and making home repairs. Although the resulting goods and services are not exchanged in a formal market, they have economic value and should be counted equally with the decedent’s forgone earnings in loss calculations. Our method for estimating nonmarket loss is to calculate the hours that each decedent would have spent in nonmarket activities, project these hours into the future, and place a value on each hour.

We estimated the number of hours for only those activities traditionally associated with housework. These are the activities that most litigation focuses on, whether full economic loss or loss to survivors is the mandated principle. We calculated total nonmarket hours for each decedent from regressions estimated with the University of Michigan’s 1975-1976 Time Allocation Study.2 Separate regressions were estimated by sex and current work status.

The results predict nonmarket time only for the first year after the accident. To calculate full nonmarket loss, the next step is establishing levels of nonmarket activity at all subsequent ages for workers and nonworkers. Once these levels are established for each decedent, the final, and most problematic, step is placing a value on each nonmarket hour. Because the goods and services produced in the home are not exchanged in a formal market, no explicit prices are attached to them or to the time used to produce them.

A concept often invoked in valuing household services is “replacement cost,” that is, what it would cost to purchase a replacement for the decedent’s former services. While intuitively appealing, the concept presents formidable methodological problems for evaluating nonmarket hours. Largely because of the way household activities are logged in time budget studies, the hours that people report devoting to a given “service” (e.g., child care) may provide a vastly inadequate measure of the actual time that must be purchased as a replacement for that service.

Our method relies on the concept of opportunity cost. It provides a basis for correctly measuring nonmarket time value. Under this concept, the value of an hour of household work is the market income the individual could have realized by spending that hour in the labor market instead. If an individual has an hourly wage of $10, a fringe package worth $3 per hour, and a marginal tax rate of 50 percent, the opportunity cost of spending another hour in household work is the $8

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forgone from an hour of work at the job ($5 in after-tax pay, plus the $3 fringe). If the individual decides to purchase a substitute to supply the household service, opportunity cost is still a viable measure: For any given level of quality, people will choose the alternative that is less expensive—that is, performing the service themselves or working to purchase a substitute.

**Personal Consumption Offset**

In most states, wrongful death statutes mandate loss to survivors as the death-damage principle. Many of these statutes require that the decedent’s personal consumption be subtracted from full economic loss in estimating the survivors’ compensation. The objective in compensating survivors is to maintain their general standard of living, despite the absence of the decedent. If the decedent’s share of consumption is not deducted from loss, the surviving family would, in principle, have a higher standard of living. The same level of resources would be shared by fewer people.

Our method of calculating the personal consumption offset involves establishing the individual’s proportion of family consumption; calculating the size of the “effective” family—that is, the survivors who are actually dependent on the decedent—and adjusting for the effects that savings might have had on the family’s future consumption.

Economic research has produced “equivalence scales” to establish the consumption levels that make families of different sizes and compositions equally well-off. Unfortunately, economists do not agree on the single best methodology for creating these scales. Advancing a new methodology was beyond the scope of this project. Thus, we averaged three of the more widely accepted equivalence scales. We used the resulting scale to estimate each decedent’s proportion of family consumption.

The consumption offset must also reflect whether and how much reported family members actually shared in family consumption and the effects of savings. The individuals who would have been actually consumption-dependent on the decedent, in each period, constitute the “effective” family. Our method for calculating effective family size involves establishing dependency values for the survivors. We also factor the effect of savings into the offset, including savings from non-market as well as market income.
Taxes

Where the objective of the tort system is compensating loss to survivors, taxes must enter the calculation in at least two ways. First, the decedent's support of his dependents' consumption is based only on his after-tax income. Thus, basing calculations on his gross income would overcompensate survivors. Second, survivors will be taxed on any investment return they realize on the compensation award. Consequently, sufficient compensation must be allowed not only to replace their lost consumption but to finance these future tax liabilities. Our tax treatment addresses three issues: computation of family income, the selection of effective tax rates, and the computation of future tax liabilities.

To apply the correct tax rate to the decedent's income and to estimate future tax liabilities of his survivors, we must first establish family income: Tax liability depends on total family income, not simply on the decedent's income. Similarly, the beneficiaries' future tax liability will be a function of both the award-generated interest and family income. Family incomes represent the sum of labor-market earnings of each family member as well as nonearnings income, such as interest, dividends, pensions, etc. In many wrongful death cases, information is available only for the decedent's income. Consequently, our methodology includes procedures for imputing family incomes for before and after the accident.

To calculate the (preaccident and postaccident) effective tax rates, we map average tax rates onto family income levels. This is not a trivial procedure, because alternative sources of income are treated differently; allowances are made for many expenses and deductions, the tax system is in flux, and every state has a different tax code. To simplify the problem, we rely on accurate average tax rates for individuals whose family incomes were similar to the decedents' incomes. For federal taxes, these rates are available from IRS tax-rate tables that are published annually. For state taxes, we relied on summary descriptions of the system operating in each state.

Discount Rate

The discount rate is vital to calculations of economic loss. If plaintiffs were paid one dollar for every one dollar lost, they would effectively be overcompensated because they can earn interest on compensation awards. Discounting serves the essential function of expressing future-year economic losses in terms of their present worth. Although economists agree that discounting is essential, they have not reached
any consensus about what discount rate is appropriate. The controversy is compounded by the variety of interest rates that exist at any given time.

The role of inflation has unnecessarily confused the issue for some courts. When inflation spurs, so do interest rates. Faced with this phenomenon, some courts have refused to adjust discount rates or allow salary growth based on future inflation, deeming inflation estimates “too speculative.” This response is based on faulty scientific reasoning and would unnecessarily undercompensate survivors. It fails to recognize the basic distinction between nominal and real interest rates.

Nominal rates are promises to pay a specified number of dollars in the future, and they are the rates usually quoted in the newspapers. Real rates are promises to pay a return in inflation-adjusted dollars. The link between them is the expected rate of inflation. The nominal interest rate equals the real interest rate plus the expected rate of inflation. Thus, existing nominal rates already incorporate a “speculation” about future inflation rates. To use a nominal interest rate (which reflects inflation) but refuse to allow inflation’s effect on salary growth is simply illogical.

Most courts have recognized this and insist on a consistent treatment of inflation. This can be accomplished by expressing both salary growth and the discount rate in nominal or in real dollars. We have chosen the latter, using the long-term discount rate of 2.75 percent.

Special Cases

Some unique issues arise in computing loss for foreign decedents and juvenile children. The study’s foreign residents presented special problems because they came from 40 different countries. We could not develop a separate set of assumptions and compile data specific to each of these countries for each element of the methodology. However, we did use different data for these countries in computing base-year income, calendar-year economic growth, and fringe rates. While the other elements involved in economic loss also differ across countries, these three elements account for a significant part of our loss calculations.

Calculating full economic loss for juvenile children is problematic because their earning potential is not established at the time of death. Further, families would have to make considerable (schooling and other) additional investments in them before they could receive their eventual adult earnings. To address these unknowns, we projected the
amount of schooling they would receive, their future market earnings, and the value of their household services. We estimated full economic loss by subtracting the projected cost of raising the child from these projected values.

It is even more problematic to calculate loss of juvenile children to survivors. This loss may be substantial because the parents have invested resources, both pecuniary and nonpecuniary, in the child. To estimate loss to survivors, we used the analogue of investment in goods (e.g., an automobile): What is the replacement cost of the investment that parents have already made in the lost child.

CONCLUSIONS

We believe that, under present economic conditions and scientific thought, our methodology represents a considerable improvement over existing methods of calculating economic loss. It can also be applied in a wide range of tort cases besides wrongful death. However, it should not be applied automatically to individual cases, ignoring their specific nature, the economic changes that affect numerical values, and the changes in scientific thought.

The Methodology's Wider Application

The methodology is not limited to aviation wrongful death cases. The sample naturally dictated the particulars of income and time period in our demonstration. However, the principles, components, and procedures can be fully applied in other cases of wrongful death. They can also be applied in personal injury cases, with two important differences. We would not deduct the injured person's personal consumption from loss, and we would add all medical costs associated with the injury. Because wrongful termination and discrimination cases involve economic loss, the methodology can also apply to them. In such cases, we would exclude the personal consumption offset and omit nonmarket loss (since people out of work actually spend more time in such activities).

Adapting the Methodology for Specific Cases

To make the correct valuation in specific cases, one must vary assumptions, as appropriate, for a decedent's demographic characteristics. In this study, we intended to provide a general approach to calculating loss for the "average" person. We were dealing with 2,113 very
diverse cases, and the assumptions had to be general enough to apply in all cases. The discount rate used for elderly decedents provides an example of cases where our general assumptions would not apply. We used a long-term discount rate in the air-crash analysis. For elderly decedents, a short-term interest rate might be more appropriate to calculate the present worth of future economic loss.

Just as the assumptions must vary to fit specific cases, the numerical magnitudes we used will change as economic and social realities evolve. For example, at any given time of litigation, economic experts might well argue for different discount and salary growth rates than we have used. The numerical magnitude of the elements will depend on how the national economy stands, as well as on longer growth trends, when the methodology is applied.

Finally, as science evolves, the methodology for computing economic loss should improve. Some economic assumptions used in the early cases would not be used today, and some principles that were considered controversial then are now commonly considered essential.
ECONOMIC LOSS AND COMPENSATION IN AVIATION ACCIDENTS

Elizabeth M. King, James P. Smith

R-3551-ICJ
Executive Summary

The tort system has a number of aims, but two stand out: deterrence and adequate and equitable compensation. The system intends to deter harmful behavior (such as the manufacture of unsafe products), while not deterring socially desirable behavior (such as producing vaccines). To fully satisfy this objective, the tort system should require that potential tortfeasors pay in some form the full cost of the harm done, and thus have an economic incentive to prevent potential harm to others.

The system also intends to ensure that plaintiffs are compensated adequately and fairly for their injuries and losses. By adequate, we mean that survivors recover the full amount of their loss. By fairly, we mean that the compensation is proportional to loss, and that people who suffer the same loss receive the same amount. One purpose of this report is to evaluate how close the system has come to achieving those aims in aviation accidents.

The study described here is the first systematic research on the relationship between compensation paid and plaintiffs’ economic losses for a large number of cases and a particular type of litigation. In this report, we compare benchmark measures of economic loss and loss to survivors with the compensation that beneficiaries actually received. These benchmarks were designed to capture the philosophical principles that underlie the tort system’s stated objectives of fairly and adequately compensating survivors and deterring harmful behavior. The benchmarks do not necessarily correspond to practices that may have been employed in particular cases when these practices fall short of the philosophical objectives. Based on our comparisons, we evaluate the system’s performance in terms of its goals. We also identify the legal and economic factors that determine how much compensation the system has been producing.
CALCULATING LOSS

For each decedent, we calculate two loss values: (1) full economic loss, and (2) loss to survivors.\(^1\)

**Full Economic Loss**

Full economic loss equals the discounted present value of the decedent's before-tax market earnings and nonmarket services. Full economic loss is the compensation principle for the deterrence objective. To deter harmful behavior, tortfeasors must pay in some way the full cost of the harm done. If tortfeasors, through all the mechanisms through which they pay, bear the full cost of the harm done, they have the right financial incentives to invest the resources needed to prevent potential harm to others.

In this study, we use the human-capital approach to estimate loss. Economists long recognized that this approach produces much smaller estimates for the value of life than the willingness-to-pay concept, which is better grounded in economic theory. Although we agree, we use the human-capital approach here because it is the only approach the courts have allowed.

We are not attempting to answer the larger question of whether society could or should rely exclusively on the tort system to provide correct safety incentives. Rather, our question is: Given the logic of the damage principle, what contribution does the actual compensation paid in the tort system contribute to the deterrence objective? Other mechanisms, including market forces and regulatory agencies, obviously also work toward that objective. To establish whether society is achieving the optimal amount of safety, we would have to look at the combined effect of these mechanisms. That is a task beyond the scope of this project. We can address only the issue of whether the tort system significantly adds to the incentives for providing airline safety.

**Loss to Survivors**

The second underlying principle is loss to survivors, which is the mandated form of compensation in most states. With this principle, the point of view shifts from how much the defendants should pay—the emphasis in terms of deterrence—to how much the plaintiffs or victims should receive. Under loss-to-survivor statutes, damages are

awarded for the present value of probable contributions the deceased would have made to his survivors had he lived.

In this study, we do not attempt to replicate the actual computation of economic loss that may have been required by any particular state law. That is not possible because we are not certain what state law would have governed in each case. Rather, we apply general standards derived from the formal principles enunciated in cases of wrongful death.

In spite of the increasingly broad definition of pecuniary loss, we also do not include a value for loss of consortium and mental anguish in our calculations of loss to survivors. This is not because such losses are “noneconomic,” while what we measured is “economic” loss. The strict distinction often made between economic and noneconomic loss does not survive much scrutiny. But loss of consortium has no market value; consequently, it is far more difficult to measure what the actual value of this type of loss should be.

In these circumstances, the most useful approach is a return to first principles, beginning with what statutes aim to achieve and what principle of compensation they imply or (sometimes) specify—that is, full economic loss or loss to survivors. Given the basic principles and the elements involved in computing loss, we have developed a methodology that corrects the deficiencies of and improves existing methods for calculating loss.

AVERAGE LOSS, COMPENSATION, AND RECOVERY RATES

Without understanding the relationship between actual loss and the compensation paid, one cannot judge how adequately and equitably the tort system meets its objectives of deterrence and compensation to survivors. The sample data and the King-Smith methodology for computing economic loss enabled us to estimate economic loss resulting from aviation fatalities, and to compare that estimate with the actual compensation paid. The comparisons show that compensation, on average, falls far below economic loss for the sample. However, they also reveal certain differences in compensation that systematically reflect patterns in loss. These patterns show why compensation varies with loss, i.e., which type of decedents will have the highest levels of economic loss.

How closely has the average compensation award approximated full economic loss or loss to survivors, as we calculate them? In Table 1 we present averages for all 2,113 decedents in our sample and for major demographic groups. The third and fourth rows indicate recovery
Table 1
ECONOMIC LOSS AND COMPENSATION RECEIVED

<table>
<thead>
<tr>
<th>Group</th>
<th>Compensation Received</th>
<th>Full Economic Loss</th>
<th>Loss to Survivors</th>
<th>Full Economic Loss to Survivors</th>
</tr>
</thead>
<tbody>
<tr>
<td>All</td>
<td>363,680</td>
<td>1,403,354</td>
<td>748,777</td>
<td>25.9</td>
</tr>
<tr>
<td>Men</td>
<td>458,792</td>
<td>1,794,447</td>
<td>1,034,236</td>
<td>25.6</td>
</tr>
<tr>
<td>Women</td>
<td>239,805</td>
<td>805,060</td>
<td>292,154</td>
<td>28.0</td>
</tr>
<tr>
<td>U.S. citizens</td>
<td>398,774</td>
<td>1,448,307</td>
<td>788,852</td>
<td>27.4</td>
</tr>
<tr>
<td>Foreigners</td>
<td>182,824</td>
<td>1,152,780</td>
<td>548,273</td>
<td>15.9</td>
</tr>
</tbody>
</table>

rates—that is, the ratio of actual compensation received to our estimates of both full economic loss and loss to survivors. For loss to survivors, they are partial recovery rates, because the calculations do not include noneconomic loss, although many of the actual awards did. If the compensation paid falls short of our estimates of loss to survivors alone, the disparity between a more comprehensive measure of loss and compensation paid is even greater than the comparison implies.

The mean full economic loss was $1,403,354; mean loss to survivors was $748,777; and mean compensation was $363,680. These figures imply a recovery rate of 26 percent for full economic loss and 49 percent for loss to survivors. The key differences between computing full economic loss and computing loss to survivors are that the decedent's own expenses and consumption are not included in the loss to survivors, and the effects of taxes must be considered. When we subtracted out the decedent's consumption and factored in the effect of taxes, the resulting mean loss to survivors was only 58 percent of the mean full economic loss.

For both male and female decedents, the recovery rates for full economic loss were quite low (26 and 29 percent, respectively), with little difference between them. For loss to survivors, however, the recovery rate for male decedents (44 percent) was much lower than that for female decedents (77 percent). The table also shows that both recovery rates for foreigners were much lower than those for U.S. citizens.

STRUCTURAL DIFFERENCES IN LOSS AND COMPENSATION

Our estimates and comparisons reveal strong, consistent differences in loss and compensation by sex, citizenship, age, work status, and number of family deaths.
Sex Differences

When a woman died in an airline accident, her beneficiaries received a mean compensation of $218,395. This compensation is less than half the mean compensation of $485,792 paid to the beneficiaries of men. However, as shown in Table 1, mean economic loss for men ($1,794,447) was 2.5 times higher than for women ($805,966). The disparity results largely from differences between the sexes in income, worklife expectancy, and salary growth.

If they worked full time, the men could earn an average base-year income of $62,293; the women could earn only $23,073. About 76 percent of the sex difference in market loss results from this substantial sex difference in earning power. Full economic loss also was larger for men, because they would work more during each year (averaged over all their remaining work years) than women would and thus would have longer expected worklives. On average, men work 25 percent more years than women do. Together, income differences and worklife expectancies explain 94 percent of the sex differences in market economic losses. Salary growth explains the rest. For each year of age, men's salary growth rate is larger than women's, and this leads to larger losses.

Sex differences were even larger for loss to survivors. For male decedents, the loss to survivors was $1,054,256, 63 percent of their full economic loss. For female decedents, the average loss to survivors was $282,154, only 37 percent of their full economic loss. This greater reduction results from differences in the type of beneficiaries that men and women had. Sixty-five percent of the men were survived by their wives (i.e., the wife was not also killed in the crash). Thus, deducting the decedent's personal consumption from the amount of full economic loss had a relatively small effect. In contrast, only 38 percent of the women were survived by their spouses. Thus, deducting the decedent's consumption greatly decreased the mean loss.

Compensation Differences by Citizenship

In Table 1 we indicate that compensation for citizens of foreign countries was only half the amount for U.S. citizens ($182,924, compared with $396,774). To some extent, this differential reflects higher levels of economic loss among Americans (because of their higher incomes) and even larger differences in loss to survivors (because foreign decedents left fewer minor dependents). But this is not the full story, because loss to survivors for foreigners ($540,273) was 69 percent
of loss for Americans ($786,952), a much smaller difference than the
difference in compensation.

Our research shows that the gap between compensation for U.S. and
foreign decedents partly reflects the international treaty limits on com-
ensation paid to air accident victims. The mean for treaty-ticket
holders was about half that for others, and 86 percent of foreign deced-
ents had treaty tickets, whereas only 33 percent of U.S. citizens did.¹

Age Differences in Loss and Compensation

Across age groups, the differences in full economic loss reflect the
typical inverted “u” shape of decedents’ life-cycle income profiles. For
example, among men, full economic loss rose sharply as we moved from
juvenile decedents ($803,794) to men in their forties ($2,196,558), and
then declined rapidly to its lowest point until after age 70, when mean
full economic loss was $260,098.

Loss to survivors has an even more pronounced inverted “u” shape
tan full economic loss does, because of the changing life-cycle pattern
of beneficiaries. For example, 86 percent of male decedents in their
forties had spouses or minor children as their primary beneficiaries.
For this group, loss to survivors is $1,770,576, or 80 percent of full
economic loss. In contrast, loss to survivors among male children less
than 15 years old is less than $50,000, and it was only $62,000 for those
men over 70.

The pattern of compensation resembles the shape of life-cycle
income profiles for loss but is less exaggerated. For all male decedents,
the mean compensation for juveniles was $128,779, increasing to
$780,883 for men aged 40 to 49, and then declining for those above age
70. This less exaggerated profile of compensation probably reflects a
more age-neutral pattern in compensation for noneconomic loss.

Work-Status Differences in Loss and Compensation

For men, mean full economic loss was 4.5 times larger for workers
($1,891,193) than for nonworkers ($405,488). For women, the loss was
2.5 times larger for workers ($1,040,812) than for nonworkers
($402,961). Work status has this effect for two reasons: First, workers
have higher potential earning power than nonworkers. Second, work
status at death plays a key role in estimating worklife expectancy and

¹Not all treaty-ticket holders were equally affected by the restrictions on compen-
sation, in part because the Warsaw Convention limits the airline’s liability in compensa-
tion but not the manufacturer’s. Consequently, compensation for some treaty-ticket
holders greatly exceeded treaty limits.
salary growth had the victim lived. Nonworkers typically would have worked less than workers in each future year. This is particularly true for women: Workers tend to stay in the workforce for extended periods, while nonworkers tend to remain out of it.

The claims files show that compensation, like full economic loss, varied considerably by work status. Among men, mean compensation was $539,995 for workers and $127,249 for nonworkers. The comparable figures for women were $263,037 and $159,048.

**Compensation Differences for Family Deaths**

Compensation differed significantly and consistently with marital status and the number of family members killed in an accident. Compensation for individual married decedents was three times higher than that for all others. However, multiple family deaths appeared to reduce the compensation amount per decedent. Compensation for married decedents who died together ($226,707) was only one-third the amount paid when a spouse survived ($692,523). These patterns are consistent with the effect that multiple deaths had on loss to survivors.

**DISTRIBUTION OF COMPENSATION AND LOSS**

These summary numbers are useful for identifying and understanding the patterns and trends in compensation awards. However, they do not capture the wide distribution of loss and compensation. We must consider that distribution in evaluating how well the system is meeting its objectives.

Compared with the average American, many victims of airline accidents were among the economic elite. Seventy-two percent of the American male decedents had professional or executive-level jobs, compared with 20 percent of the U.S. male workforce during this period. This concentration of decedents in the professional categories also was reflected in their incomes, which were almost twice the U.S. average.

Despite their high average income, the airline crash decedents had widely dispersed earning ability. In their first year of work after the accident, 10 percent of male decedents would have earned less than $9,000, while 5 percent would have earned more than $175,000. This income dispersion is reflected in the distribution of both loss and compensation shown in Table 2.

Although the mean compensation was $383,680, over half the sample received less than $200,000. On the other end, about 7 percent had compensation of more than $1 million. High awards and the diversity
Table 2
DISTRIBUTION OF COMPENSATION AND LOSS
(Percent of decedents)

<table>
<thead>
<tr>
<th>Potential Income ($ thousands)</th>
<th>Compensation</th>
<th>Loss to Survivors</th>
<th>Full Economic Loss</th>
</tr>
</thead>
<tbody>
<tr>
<td>0–100</td>
<td>24.3</td>
<td>27.5</td>
<td>3.3</td>
</tr>
<tr>
<td>101–250</td>
<td>34.2</td>
<td>20.6</td>
<td>8.8</td>
</tr>
<tr>
<td>251–500</td>
<td>18.1</td>
<td>15.5</td>
<td>12.9</td>
</tr>
<tr>
<td>501–1,000</td>
<td>15.8</td>
<td>13.7</td>
<td>22.3</td>
</tr>
<tr>
<td>1,001–2,000</td>
<td>6.5</td>
<td>14.5</td>
<td>34.8</td>
</tr>
<tr>
<td>2,000+</td>
<td>1.1</td>
<td>10.0</td>
<td>17.8</td>
</tr>
</tbody>
</table>

of awards are sometimes seen as evidence that compensation is unsystematic, inequitable, and, for some cases, excessive. However, this diversity is actually much less than the dispersion of full economic loss—and does not begin to match the variation in loss to survivors. Indeed, the large awards that have recently raised concern about “runaway” juries simply may represent a fair adjustment to undercompensation for high-loss victims.

Ten percent of the whole sample had estimated full economic losses above $2 million, and one of every 100 decedents had a loss greater than $7.5 million. At the other end of the scale, one in ten decedents had a full loss of less than $200,000. The dispersion in full economic loss not only persisted for loss to survivors, but also was greater. For 10 percent of the decedents, loss to survivors amounted to at least $2 million, and for one in 20, at least $2.7 million. At the other end of the scale, it is modest: 27 percent of the decedents had a loss to survivors of less than $100,000. These variations in loss suggest that, rather than being “too diverse,” compensation is not sufficiently diverse to equitably compensate survivors.

WHAT DETERMINES COMPENSATION PAID TO SURVIVORS?

If the tort system is going to meet the adequacy test of its death-damage principles, compensation paid should equal loss. For the aviation cases, patterns in compensation mirror patterns in loss, but at much lower values. Moreover, compensation is sometimes quite different for cases involving similar losses. Our data have made it possible for the first time not only to make independent estimates of loss,
but also to identify other factors that may systematically influence compensation by controlling further effects of losses.

EMPIRICAL MODELS OF COMPENSATION

Because loss to survivors is the death-damage principle in most states, it should be critical in determining the actual compensation paid, and our empirical results show that it has been. For men, the mean partial recovery rate was 44 percent (the ratio of an average compensation of $458,792 to mean loss to survivors of $1,054,256). For female decedents, it was 77 percent (the ratio of an average compensation of $218,385 to a loss to survivors of $282,164). Although compensation rose with loss, it did so at a less-than-proportionate rate. For both sexes, partial recovery declined markedly as loss exceeded $2 million.

In comparing our computed values of loss to survivors with the actual compensation they received, we must keep in mind two measurement problems:

- Two states legally mandate full economic loss as the compensation principle. One of the crashes occurred in such a state. For decedents under these jurisdictions, full economic loss is thus more relevant than loss to survivors in making comparisons with compensation.
- Total compensation includes not merely compensation for economic loss, but also payments for loss of consortium, mental anguish, pain and suffering, funeral expenses, and attorney fees. However, loss to survivors measures only financial loss to survivors. Although we cannot measure noneconomic loss directly, we can measure payments for it indirectly. Compensation for noneconomic loss represents approximately one-third of total compensation.

In summarizing the results of our empirical estimates, we use the four sets of variables used in our companion study of dispute resolution:

- Characteristics of decedents,
- Characteristics of plaintiffs,
- Characteristics of defendants and accidents, and
- Characteristics of the legal environment.

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To establish how characteristics other than loss influence compensation, we controlled for loss in measuring their effects. That is, our analyses established the effects that these characteristics had, independent of the loss involved. When we state that cases with certain characteristics had higher or lower compensation, the implicit comparison is with cases that had similar economic loss.

Characteristics of Decedents

We found several decedent characteristics that affected compensation significantly, independent of loss:

- **Sex.** At low levels of economic loss, compensation was higher for U.S. female decedents than for U.S. male decedents. The reverse was true at high levels of economic loss. Recovery rates for U.S. women were lowest where losses exceeded the $2 million mark.

- **Citizenship.** Our estimates indicate that foreigners were not treated equitably in compensation. In their cases, compensation was 29 percent lower than compensation for U.S. males—even after we controlled for both economic loss and flying with a treaty ticket.

- **Temporary survival.** Because total loss is higher, pain and suffering awards should be larger in cases where a passenger temporarily survived the accident. Our empirical estimates show that, when this happened, compensation was 47 percent higher.

Although poor health had no independent effect on compensation, the findings provide an interesting insight into litigation effects. Poor health should lower the amount of compensation because it would be likely to reduce lifetime earnings. However, our empirical study of litigation behavior found that compensation was not statistically different for those reported in poor health at the time of the accident. Poor health apparently increased the likelihood of, and length of time spent in, litigation. We infer that this increased litigation may have helped raise the compensation to the levels for decedents not in poor health.

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8Our analysis of litigant behavior is contained in King and Smith, *Dispute Resolution Following Airplane Crashes*, op. cit.
Characteristics of Plaintiffs

Plaintiffs' family characteristics have a strong effect on compensation paid. The closer the relationship between decedent and beneficiary, the greater the odds that a plaintiff will receive payments for noneconomic loss (such as loss of consortium). Plaintiffs more closely related to the decedent received higher compensation for their loss than other claimants even after we controlled for the effects these relationships have on economic loss to survivors. Compensation was 47 percent larger when the decedent was survived by a spouse or by a juvenile child, and 16 percent larger when the decedent was a minor child survived by a parent.

We used these estimates to calculate payments for noneconomic loss. Mean compensation for economic loss was $235,097, roughly two-thirds of total compensation ($363,586). Mean compensation for noneconomic loss was $128,489. Given these figures, our estimate of the recovery rate for economic loss was only 31 percent.

Three other plaintiff characteristics also affected compensation:

- **Multiple family damages** lower recovery rates because recovery rates decline with the value of total loss. Our empirical results showed a decline of 4 percent with multiple damages.
- **Age** inversely measures the length of remaining life over which the claimant can use the compensation received. This predisposes older beneficiaries to accept a lower settlement offer at any given loss level. In our sample, when the primary beneficiary was over 70 years of age, compensation was 7 percent smaller than that for beneficiaries between 20 and 59.
- **Wealthier beneficiaries** received slightly more compensation. They were better able to afford the cost and extended wait for compensation entailed by trials, and cases that go to trial receive more compensation.

Characteristics of Defendants and Accidents

Defendants care about the total cost of an accident as well as the payment for an individual claim. Because total loss in the accident affects their litigation decisions, it also could affect compensation amounts. We found that, indeed, compensation was lower for decedents in larger accidents than for those in smaller accidents. To illustrate, compare identical decedents with the same loss to survivors ($748,000, the mean value). Compensation in small accidents (100 victims with a per-person loss of $0.5 million) was $376,000. However, if
the crash was large (200 victims with a per-person loss of $1 million), compensation for the identical individual was only $300,000.

In contrast to this effect, plaintiffs received 14 percent higher compensation in accidents in which more than one defendant paid damages. If multiple defendants indicate a liability dispute, this finding may suggest that defendants have to pay more when they do not present a united front.

Characteristics of the Legal Environment

Caps on recovery affected litigant behavior significantly but differently, depending on their source. Two accidents occurred in West Virginia and Massachusetts, states that at that time imposed limits on recovery. These state limits deterred litigation and might thus be expected to have decreased compensation as well. Our results indicate that compensation in these crashes was 24 percent lower for those passengers with losses above the treaty cap.

In contrast, the analysis of litigant behavior showed that international treaty limits had a different and more complex effect on litigation. To deal with this complexity, we distinguished between cases with one defendant and cases with more than one defendant. In cases with one defendant, the airline is always the defendant and the international treaty limit of $75,000 may influence total compensation. In cases with more than one defendant, the treaty limit may be less relevant because it governs only compensation from the airline. Other potential defendants, such as the aircraft manufacturers, are not included.

Our empirical data showed that when a claim potentially was limited by an international treaty and had only one defendant, compensation was significantly lower. However, where more than one defendant was involved, compensation for internationally ticketed passengers differed little from compensation for passengers without international tickets.

We also found that compensation had increased during the last few years of the data. Average loss to survivors also increased during that time. However, controlling for loss to survivors, we found that compensation amounts were, indeed, larger in the most recent period (1980 to 1982). In the earliest period (1970 to 1972), compensation amounts were 31 percent less, while those in the middle two periods (1973 to 1975 and 1976 to 1978) were 25 percent smaller.

Last, we found that the stage at which a case closes affects compensation. Because cases that settle are intrinsically different from those that go to trial, we must control for the level of economic loss before we consider net recovery rates. When we do so, we find that, generally,
rates of recovery are higher for those who proceed farther in the litigation process.

POLICY-RELEVANT CONCLUSIONS OF THE RESEARCH

Does the System Provide a Significant Deterrent?

As we said above, we are not attempting to answer the larger question of whether society could or should rely exclusively on the tort system to provide correct safety incentives. Rather, our question is: Given the logic of the death-damage principle, would the actual compensation paid during the period covered by our analysis have met that objective?

Our analysis shows that actual compensation paid was far short of full economic loss. The mean compensation of $363,680 is 26 percent of the mean full economic loss of $1,403,359. On average, tortfeasors in our airliner accidents paid out 26 cents for every dollar of social cost incurred.

Actually, the disparity between compensation and full economic loss is considerably larger than our estimates imply, because we used the human-capital approach. Had we used the willingness-to-pay concept, which is theoretically better grounded, the mean estimates would have been $5.3 million, which is almost four times our estimate. Put another way, total compensation for all 25 aviation accidents was approximately $770 million. Our estimate of the full economic costs associated with the decedents' lost future earnings was almost $3 billion. If willingness-to-pay estimates of the value of life were used, the total economic loss would be over $11 billion.

If we take $5.3 million as the average value of life, the compensation to airline victims is less than 7 percent of the true economic cost of a damage. That is, for every dollar of true economic cost, defendants are paying only 7 cents. Given the death-damage principle for deterrence, the compensation paid falls far short of imposing effective financial incentives to invest in airline safety.4

For at least two reasons, the implications of this conclusion must be carefully considered. First, deterrence is not the sole objective of the tort system and perhaps should not be a major objective. Many observers would claim that compensation is the far more critical objective, and compensation to survivors is the objective embodied by most state statutes. Second, other ways of motivating defendants to invest in airline safety may be preferable to relying on the tort system. For

4The transactions costs to defendants do not alter this conclusion, because they are trivial relative to the human life lost. Defendants’ total transactions costs were approximately $110 million, a small amount relative to the $11 billion of lost life.
example, market forces and regulatory agencies also act to provide safety incentives. Airlines that persistently engage in unsafe practices eventually may lose customers, a cost as real as the compensatory damages they have to pay in accidents. The only conclusion this study can reach unambiguously is that the present system of compensation does not by itself add any significant financial incentives for safety that are commensurate with the full cost of accidents.

Is Compensation Adequate and Equitable?

A second important objective of the tort system is to compensate for injuries. Given this objective, concern shifts to whether plaintiffs receive adequate compensation for their injuries and losses, and whether the compensation is distributed fairly among the plaintiffs. Before we subtracted payments to lawyers from the compensation received, the average recovery rates (the ratio of compensation received to loss to survivors) was only 49 percent. That is, plaintiffs recover only half the damage done.

As we said above, partial recovery declines with the size of loss to survivors. In the bottom 30 percent of the distribution, partial recovery rates actually exceeded 100 percent. Thereafter, recovery rates declined rapidly, reaching a value of 67 percent at the median, and falling to about 19 percent in the top segment of the distribution. Further, these recovery rates overstate recovery for economic loss alone. Our estimates indicate that one-third of total compensation was for noneconomic components of loss (including loss of consortium). The average recovery rate for economic loss alone was 31 percent.

To this point, we have compared plaintiffs' compensation relative to loss to survivors. However, plaintiffs cannot use the entire award to replace the contributions they had been receiving from the decedent. They first must pay lawyers for any legal services. For the 2,113 cases for which we can compute economic loss, plaintiffs incurred average litigation expenses of approximately $70,000, about 20 percent of total compensation. Across all cases, net partial recovery rates are 39 percent, compared with the gross rate of 49 percent. Thus, from every dollar of loss, plaintiffs receive only 39 cents to replace their lost support.

We believe there are five reasons that partially explain why we found such low recovery rates.

First, for whatever reason, the tort system appears more reluctant to use the stated rules when they imply large awards. Our finding on recovery rates is consistent with the pattern of tort cases other than
aviation accidents. Because airline loss values are, on average, large, this pattern is especially apparent in our sample.

Second, in some cases, limitations on awards were externally imposed. In particular, the Warsaw Convention and the Montreal Agreement greatly affected awards by stringently limiting liability for passengers with international tickets. If the U.S. tort system aims to ensure that similarly harmed individuals receive the same compensation, these international treaties are antithetical to that objective.

Third, decedents' beneficiaries are probably risk-averse, that is, willing to accept a sure lower payment rather than try for a larger expected amount at great cost. This hypothesis is consistent with less-than-total recovery, and with the decline in recovery rates for higher loss to survivors.

Fourth, our standards reflect an increasing tendency toward a broader definition of economic loss and compensation in economics research, statutory provisions, and judicial interpretation. This recent liberalization builds on a trend, more than a century long, toward more inclusive damages in wrongful damage. Our principles in computing loss correspond to the endpoint of this evolution. However, not all courts have accepted this broader definition, and not all the cases in our sample reflect it. Because of this disparity between principles concerning loss, we find lower recovery rates.

Fifth, in a number of instances, experts used methods to calculate loss that were analytically incorrect and served to reduce the size of the net award. When confronted with opposing arguments on difficult issues, judges have often, and understandably, closed the debate by ruling that the question was “too speculative.” The problem with the “too speculative” label is that, in practice, it often implied that zero was the correct answer.

In recent years, the more inclusive definition of economic loss and the growing economic sophistication of the courts has led to a rise in recovery rates. During the last time period, 1979 to 1982, partial recovery rates for aviation accidents rose to 59 cents on the dollar, compared with 41 cents on the dollar in the first year in our study. If we compute what we believe to be the more appropriate recovery rate on economic loss alone (separating out our estimate of compensation payments for such nonpecuniary loss items as loss of consortium), plaintiffs were paid 39 cents on the dollar for economic loss during the most recent time period, 1979 to 1982.

From our time-series comparisons, we can draw a number of inferences. First, the bottom line conclusions regarding whether the compensation paid is adequate, fair, or contributes significantly to deterrence was not affected by the time period. No matter what time period
is considered, compensation in the tort system falls short of achieving these standards. Nevertheless, these time-series patterns also indicate that the tort system performance is evolving. Compensation and recovery rates have risen dramatically, even for cases with the same loss.
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