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ACCIDENT COMPENSATION FOR AIRLINE PASSENGERS: AN ECONOMIC ANALYSIS OF LIABILITY RULES UNDER THE WARSAW CONVENTION

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THE FAILURE TO ATTAIN unanimous international agreement on a universal maximum compensation limit for airline accident victims has diluted the impact of the Warsaw Convention.¹ To a large degree, the adoption of a single maximum award,² stated in terms of gold

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¹ See Cheng, *Fifty Years of Warsaw Convention: Where Do We Go From Here?* 28 ZEITSCHRIFT FÜR LUFT- UND WELTRAUMRECHT 374-75 (1979).

² The initial liability maximum was 125,000 francs. Convention for the Unification of Certain Rules Relating to International Transportation by Air, 49 Stat. 3000, T.S. No. 876 (1934), reprinted at 49 U.S.C. § 1502 (1982) [hereinafter cited as Warsaw Convention]. This sum was translated into international exchange as 8,300 Special Drawing Rights ("SDRs") (roughly equivalent to \$7,885 American dollars) in Additional Protocol No. 1 to Amend the Convention for Unification of Certain Rules Relating to International Carriage by Air Signed at Warsaw on 12 October 1929, ICAO Doc. No. 9145 (1975) [hereinafter cited as Montreal Additional Protocol No. 1]. This maximum amount was increased to 250,000 francs (16,600 SDRs) by the Protocol to Amend the Convention for the Unification of Certain Rules Relating to International Carriage By Air Signed at Warsaw on 12 October 1929, 478 U.N.T.S. 371, 381 (1963) [hereinafter cited as Hague Protocol] and to 100,000 SDR's by the Protocol to Amend the Convention for the Unification of Certain Rules Relating to International Carriage By Air Signed at Warsaw on 12 October 1929 as Amended by the Protocol Done at the Hague on 28 September 1955, ICAO Doc. No. 8932 (1971) [hereinafter cited as Guatemala City Protocol]. The SDR is a unit account used to express international prices and values without referring to a national currency. The SDR's value is formed by a

or an international currency, has raised many difficulties.³ The attempt to define a commodity (such as gold) as a universal standard has created confusion as to which value to use when the value of the commodity has fluctuated.⁴ Additionally, inflation has eroded the value of each proposed maximum limit; and while the maximum has increased several times, such increases have been proposed infrequently, and delays in implementation have resulted in considerable lags in adjusting the maximum to rising living costs and income levels. The inequities in existing maximums have been accompanied by challenges to these maximums.⁵ Finally, international differences in earnings (and hence losses due to accidents) between passengers residing in different nations have rendered a single maximum unfair to the residents of wealthier nations.⁶

market basket of currencies of 16 trading nations. Each currency can be expressed in terms of the United States dollar, and an overall weighted average value of all currencies forms the value of the SDR. See G. FEIGER & B. JACQUILLAT, *INTERNATIONAL FINANCE*, 50-54 (1982). The value of the SDR in terms of the United States dollar in February, 1985 was about 95 cents. *Wall St. J.*, Feb. 25, 1985, at 46, col.7.

³ See Martin, *The Price of Gold and the Warsaw Convention*, 4 *AIR L.* 70, 72 (1979).

⁴ See *Trans World Airlines, Inc. v. Franklin Mint Corp.*, 104 S.Ct. 1776 (1984). In *Franklin Mint*, the Franklin Mint Corporation placed 714 pounds of coins on a Trans World Airlines (TWA) flight from Philadelphia to London. The shipment was lost, and Franklin Mint sued TWA for \$250,000. The court was called upon to decide the proper conversion unit for converting the liability limitations of the Warsaw Convention into United States currency. The Supreme Court held that the proper conversion factor was the last official United States price of gold. *Id.* at 1784.

⁵ See *In re Air crash in Bali, Indonesia*, on April 22, 1974, 684 F.2d 1301 (9th Cir. 1982). In *Bali*, the plaintiffs argued that the Warsaw Convention's liability limitations constituted an unconstitutional taking of property without due process of law. *Id.* at 1309. Additionally, the plaintiffs argued that the liability limitations constituted an impermissible travel restriction. *Id.* The Ninth Circuit, while stating that the plaintiffs arguments had some merit, concluded that these arguments would fail if another remedy, such as a Fifth Amendment taking claim against the United States, was available. *Id.* at 1310. See U.S. CONST. amend V. For a detailed discussion of the constitutionality of the Warsaw Convention liability limitations, see Comment, *Due Process, Equal Protection and the Right to Travel: Can Article 22 of the Warsaw Convention Stand up to these Constitutional Foes*, 49 *J. AIR L. & COM.* 907 (1984); Comment, *After Bali Can the Warsaw Convention Be Proven a Taking Under the Fifth Amendment*, 49 *J. AIR L. & COM.* 947 (1984).

⁶ See Sand, *Air Carriers' Limitations of Liability and Air Passengers' Accident Compensation Under the Warsaw Convention*, 28 *J. AIR L. & COM.* 260, 266 (1962). Sand states:

It must be admitted that efforts to set uniform amounts of recovery

The primary purpose of this paper is to develop a proposal in which compensation arrangements would be brought more in line with actual economic losses. This can be achieved without abandoning international agreement altogether by the acceptance of a uniform procedure by which all losses would be evaluated.⁷ A maximum award, based on the distribution of actual estimated losses and on a judgement of how many potential victims' dependents would not receive full compensation by receiving the maximum award, could be formulated using the proposed evaluation procedure. In addition to requiring that all compensation regulations be related to actual losses in an explicit manner, such a procedure would avoid many difficulties related to changing currency and gold values, inflation, and international income difference.

I. BACKGROUND

In an effort to obtain uniform liability regulations across nations, the drafters of the Warsaw Convention's

are in the borderland of feasible international unification. Although the monetary value of 250,000 gold francs . . . may be the same in all member countries, this standard does not take into account differences in the national average income per capita which determines the standards of damage compensation. Not only the so-called under-developed countries, but also Western Europe lags far behind the United States and Canada in this respect.

Id.

⁷ Both airlines and their insurance companies benefit from liability limitations because their potential payout would be limited. If insurance premiums paid by airlines are lower as a result of these limitations, airline passengers might benefit from lower fares, to the extent that lower premiums are passed on to the passengers. Additional benefits of an international agreement to travelers include choice of jurisdiction to plaintiffs, and the protection of citizens of signing countries before foreign courts. See Sand, *supra* note 6, at 266. According to the United States Senate Committee on Foreign Relations, an international system of rules and practices in this area would "bring airlines around the world at least up to the minimum level of compensation for loss of life, insure quick and reliable recoveries (in most cases within six months)" SENATE COMMITTEE ON FOREIGN RELATIONS, MONTREAL AVIATION PROTOCOLS NOS. 3 & 4, S. EXEC. REP. NO. 1, 98th Cong., 1st Sess. 6 (1983) [hereinafter cited as SENATE REPORT ON MONTREAL AVIATION PROTOCOLS].

Article 22⁸ proposed a universal limit on an international airline carrier's maximum liability to international passengers.⁹ Article 23 of the Convention proposed the rule of presumed fault on the part of the carriers,¹⁰ in the absence of carrier misconduct or negligence.¹¹ These limits were widely accepted as evidenced by the number of countries which have ratified, or agreed to adhere to, the 1929 Convention.

As real incomes have increased over time, the value of the maximum liability has been deemed to be unacceptable.¹² Accordingly, the proposed maximum limit was doubled from the equivalent of 8,300 SDR's to 16,600 SDR's by amendments made in the Hague Protocol of 1955.¹³ The United States has yet to accept this limit, or the limit of 100,000 SDR's proposed in 1971 at Guatemala City.¹⁴ To avoid the denunciation of the Warsaw Convention by the United States, an unofficial agreement among international airlines serving the United States was reached in 1966.¹⁵ By this private agreement, known as the "Montreal Agreement," the airlines agreed to increased Article 22 limits; they established a strict (i.e. the carrier waives defense) liability limit of \$75,000 gross of legal fees (\$58,000 net of legal fees) with prompt settle-

⁸ Warsaw Convention, *supra* note 2, art. 22.

⁹ Article 22 provides: "In the Transportation of passengers the liability of the carrier for each passenger shall be limited to the sum of 125,000 francs" Warsaw Convention, *supra* note 2, art. 22. Currently, 125,000 francs are roughly equivalent to 8,300 SDRs. See *supra* note 2 for a discussion of SDRs.

¹⁰ Article 23 provides: "Any provision tending to relieve the carrier of liability or to fix a lower limit than that which is laid down in this convention shall be null and void. . . ." Warsaw Convention, *supra* note 2, art. 23.

¹¹ Article 25 provides: "The carrier shall not be entitled to avail himself of the provisions of this convention which exclude or limit his liability, if the damage is caused by his willful misconduct. . . ." Warsaw Convention, *supra* note 2, art. 25.

¹² See Sand, *supra* note 6, at 261; Cheng, *supra* note 1, at 374.

¹³ See Hague Protocol, *supra* note 2, at 383.

¹⁴ See Guatemala City Protocol, *supra* note 2, at 8, art. XIV. See also Comment, *From Warsaw to Tenerife: Chronological Analysis of the Liability Limitations Imposed Pursuant to the Warsaw Convention*, 45 J. AIR L. & COM. 653, 672-77 (1980) (United States has yet to adopt the provisions of the Hague Protocol or the Guatemala City Protocol).

¹⁵ SENATE REPORT ON MONTREAL AVIATION PROTOCOLS, *supra* note 7, at 3.

ment dates specified.¹⁶ This agreement, however, does not have the force of law.

One additional proposed set of arrangements has emerged in the Warsaw Convention amendments. These arrangements specifically allow domestic supplements to be financed by "contributions from passengers," thus serving as a mandated insurance system.¹⁷ One such supplement has been proposed by the United States.¹⁸

II. AN ECONOMIC FRAMEWORK FOR ACCIDENT VICTIM COMPENSATION

A. *Valuing the Economic Loss*

The basis of our approach to evaluating an economic loss is that compensation for an accident is made for a loss of economic value. Hence it is particularly appropriate in the cases where deaths occur to determine the individuals who lose the economic value.¹⁹ In addition to the most

¹⁶ *Id.*

¹⁷ Article 35a of the Guatemala City Protocol provides:

No provision contained in this Convention shall prevent a state from establishing and operating within its territory a system to supplement the compensation payable to claimants under the Convention in respect of death, or personal injury, of passengers. Such a system shall fulfill the following conditions: (a) it shall not in any circumstances impose upon the carrier, his servants or agents, any liability in addition to that provided under this Convention; (b) it shall not impose upon the carrier any financial or administrative burden other than collecting in that State contributions from passengers if required to do so. . . .

Guatemala City Protocol, *supra* note 2, art 35a.

¹⁸ A United States proposal for a domestic supplement compensation plan was very much in the spirit of article 35a: "A domestic supplemental compensation plan allowing for a total passenger liability limit of \$320,000 (\$200,000 in coverage in addition to the carrier's liability of \$120,000 under the Protocol) was developed by the United States Government with Prudential Insurance Company as the Contractor." See Senate Report on Montreal Aviation Protocols, *supra* note 7, at 3. The plan was approved by the Civil Aeronautics Board as an inter-carrier agreement, pursuant to section 412 of the Federal Aviation Act, on July 20, 1977. *Id.* See *Aviation Protocols, 1977: Hearings Before the Sen. Comm. on Foreign Relations*, 95th Cong., 1st Sess. (1977) (statement of Alan Furgeson).

¹⁹ The word "value" is relative, and if it is to have any meaning, not only must the values be known, but also who loses the value must be known. See B. KIKER, *HUMAN CAPITAL: IN RETROSPECT* 84-90 (1968).

obvious situation of compensation for dependents in the form of income and services, an individual has a value to his or her employer, to the state as a citizen and taxpayer, and to any organization he or she helps support. If "value" is defined to include only income and services provided to dependents, the estimation procedure is slightly different from that used if value includes the individual's contribution to society. One major difference is that, in the former case, it is necessary to deduct expected future personal taxes and personal consumption expenditures from expected future earnings before capitalization to determine the actual value to be received by the dependents.²⁰ If the determination of an individual's value to society is desired, then perhaps we should capitalize expected future gross earnings in order to estimate the loss.²¹ This result might be the case since society loses the entire gross earnings of the individual.

The standard way of calculating economic loss is to calculate the present value of the stream of benefits which would have been received by the individual(s) suffering the loss had the accident not occurred.²² In what follows, it is assumed that the accident victim was killed, and that his or her dependents are the ones being compensated.²³

²⁰ *Id.*

²¹ See Kiker & Birkeli, *Human Capital Losses Resulting from the War in Vietnam*, 80 J. POL. ECON. 102 (1972).

²² See B. KIKER, AN ANALYSIS OF MONETARY LOSS RESULTING FROM PERSONAL INJURY OR DEATH, PROOF OF ECONOMIC LOSS (Continuing Legal Education. Division of the South Carolina Bar, 1980), at 46-73.

²³ The economic loss to a victim's dependents can be measured by substituting appropriate values in Equation (1):

$$K = \sum_{t=1}^{h-1} [W_t(1+V)^{t-1} - C_t(1+Q)^{t-1}]/(1+r)^{t-1}]$$

The symbols in this equation and their interpretation are summarized in Table 1. Although most of the variables' interpretations can be understood from this table, several require elaboration. "W" stands for the expected gross earned income at the date of death if the individual were gainfully employed, less personal income taxes of the victim, plus income such as pension benefits in a base year. If the individual was not gainfully employed, but was expected to be in the future (e.g. if he was a student), "W" can be estimated based on what the individual most likely would have earned had she been employed. Any "unearned income", such as

To demonstrate the use of such evaluation technique, assume an American male, aged 35, as of 1983, receiving the average annual salary of a worker in the executive, administrative, and managerial class of \$26,119.²⁴ Assume that this individual has a working life of thirty years (variable "h"), that his net earnings and personal consumption expenditures are thought to increase by eight percent, and that the "appropriate" discount is eight percent. Assume further that his personal taxes would be fifteen percent of gross annual salary over his work-life expectancy and that this individual incurs personal expenditures ("C") of about twenty-two percent of annual net earnings annually.²⁵ Given these assumptions, the present value of the loss of net income less personal consumption expenditures to the individual's beneficiaries is \$519,510.²⁶

Although the valuation of the benefits of working individuals is quite straightforward, there are always problems with the forecasting of future events and with determining

interest payments, is excluded, because presumably these would continue to be received by the dependents. The victim's own personal expenditures, "C", would not appear as benefits to the dependents. The variables "V" and "Q" are often referred to as the "increase factors" in appraisals of economic loss in wrongful death litigation. See Dick, *Determining the Present Value of Future Income: Selecting Income Growth Rates*, 41 J. RISK & INS. 729 (1974). Bell & Taub, *Selecting Income Growth and Discount Rates in Wrongful Death and Injury Cases: Additional Comments*, 44 J. RISK & INS. 122 (1977); Smith, *The Use of Inflation Factors in Determining Settlements on Personal Injury and Death Suits*, 43 J. RISK & INS. 369 (1976). The parameter "h" denotes the probable number of years the victim would have worked. The variable "r" can be thought of as the decrease factor in determining the present monetary worth of a future stream of income or services. See Edwards, *Selecting the Discount Rate in Personal Injury and Wrongful Death Cases*, 42 J. RISK & INS. 342 (1975).

²⁴ BUREAU OF THE CENSUS, U.S. DEP'T OF COMMERCE, STATISTICAL ABSTRACT OF THE UNITED STATES 1985, Washington, 1985, Table 699.

²⁵ See E. CHEIT, INJURY AND RECOVERY IN THE COURSE OF EMPLOYMENT 78 (1961).

²⁶ This solution is found by inserting the appropriate values into Equation 1,

$$\$519,510 = \sum_{t=1}^{30} [\$22,201(1+.08)^{t-1} - \$4,884(1+.08)^{t-1}]/(1+.08)^{t-1}$$

where \$22,201 is 85 percent of the earnings loss in 1982 of \$26,119, and t is the appropriate time period (e.g., an age of 35 indicates a value of t of 1, age 36 indicates a value of t of 2, and so on). The sigma sign indicates summation over a number of time periods, in this case from ages 35 through 65.

TABLE 1

<u>SYMBOL</u>	<u>EXPLANATION</u>
K	The present value of the expected future net loss to the dependents as a result of the accident victim's death.
W	The income variable upon which the dependent's loss is based.
V	The rate of increase in earnings which the victim would likely have experienced over his expected work life.
C	The value of personal expenditures at the time of death which would be expected to be incurred by the individual alone.
r	An appropriate rate of discount, to express future expected benefits, in terms of a present value.
h	Work life expectancy of the decedent had the accident not occurred, measured from the time of the accident.
A	Actual award received by dependents in compensation for loss resulting from accident victim's death.
FEE	Legal fees of dependents in attempting to receive compensation.
NC	Compensation to dependents net of legal fees (equal to Actual award (A) less legal fees (FEE)).
P _s	Probability of a successful attempt on the part of the plaintiffs to obtain compensation.
P _n	Probability of an unsuccessful attempt on the part of plaintiffs to obtain compensation.
PVNC	Present value of net compensation (NC).
E(PVNC)	Present value of expected (weighted average) net compensation received.
MAX	Maximum limit of compensation.

a loss of value for dependents of non-working victims.²⁷

B. *Measures of Compensation*

The compensation received by dependents may or may not approximate the economic loss they have incurred. The actual award received, "A", can be determined a number of different ways. The economic value of the loss is only one.²⁸ Of course, legal fees ("FEE") must be deducted from A to obtain a measure of the total compensation actually realized by the dependents, ("NC"). According to a study done by Judge Peirson Hall, legal fees in the United States average seventeen percent of the value of settlements.²⁹ If we use the slightly higher proportions recommended by the Montreal Agreement,³⁰

²⁷ The valuation of a housewife's services is somewhat more complex. See Gronau, *The Interfamily Allocation of Time*, 6 AM. ECON. REV. 634 (1973); Hawrylyshyn, *Towards a Definition of Non-Market Activities*, 23 REV. INCOME & WEALTH 79 (1977); Hunt & Kiker, *Valuation of Household Services: Methodology and Estimation*, 46 J. RISK & INS. 697 (1979). Suppose the decedent is engaged only in household production; how can the value of the loss of household services be estimated? In estimating the loss of these services, the annual value of the services performed by the spouse replaces "W" in Equation 1. In the formula above, "K" now becomes the present value of expected future household services performed by the individual. Three procedures are used to measure the value of effort devoted to home production. Borrowing from economic theory, the first is the "opportunity cost" approach. According to this approach, the value of an additional hour of time is the same in all uses of the time, whether at work on the job or performing household duties.

In the second procedure, the "aggregated replacement cost" approach, the total hours an individual is likely to spend in home production is determined and then valued at the market wage for domestic help. The third and most reasonable approach to estimating the value of household services seems to be the segregation of productive home services into categories in which separate market price equivalents are computable, such as meal preparation, laundry work, house cleaning, shopping, childcare and miscellaneous activities such as general repairs. After determining the hours devoted to these services, the price of market substitutes for time in each of these services is used to ascertain the economic value of home production.

It is important to point out that the decedent may have been both gainfully employed and providing household services to his or her dependents. If so, then both a value of lost earnings and a value of household services must be estimated and considered in determining the present value of economic loss to dependents.

²⁸ See, e.g., Kiker & Birkeli, *supra* note 21.

²⁹ See Hall, Memorandum to M.D.L. Panel, April 28, 1978.

³⁰ Senate Report on Montreal Aviation Protocols, *supra* note 7 at 3.

then with a value for A of \$75,000 an amount of \$58,000 would be received by the dependents. The \$17,000 difference would represent legal fees. Thus legal fees would be about twenty-three percent of the total settlement.

If cases are litigated, then the present value of NC should be reduced because compensation is received in subsequent years and is subject to a time discount.³¹ According to a Civil Aeronautics Board study, about twenty percent of all litigated airline accident cases are settled in each of the five years following the accident.³² If the average dependent received a \$100,000 award three years after the accident (roughly the average settlement time), r is eight percent, and legal fees are thirty percent of the award, then the dependents would receive net compensation of about \$55,570 when valued as of the time the loss occurred.³³

The above calculations have been made under the assumption that compensation is a certainty. It is true that in specific instances, such as under strict liability, dependents will almost certainly receive compensation in the event of an accident. The imposition of strict liability on airlines, as under the Montreal Agreement³⁴ or as set out in the Warsaw Convention,³⁵ is tantamount to offering victims' dependents the certainty of compensation. This is not the only conceivable compensation arrangement. If fault must be established in court, then in the absence of an out-of-court award, it is uncertain whether the victims' dependents will receive any award at all. Moreover, even if the dependants receive an award, the size of the settle-

³¹ The present value of NC ("PVNC") is expressed in equation 2, where t is the time of settlement and r is the discount (interest) rate: $PVNC = NC / (1 + r)^t$

³² CIVIL AERONAUTICS BOARD, *Levels of Recoveries on Account of Passenger Deaths and Serious Injuries in Airplane Accidents: Aviation Protocols, Hearing Before the Senate Comm. on Foreign Relations*, 95th Cong., 1st Sess. 19 (1977).

³³ The present value at the time of the accident of a net award of \$70,000 (that is, a gross award of \$100,000 less 30 per cent for legal fees) received three years from the time of the accident is $\$70,000 / (1 + .08)^3 = \$55,570$.

³⁴ See *supra* note 7 and accompanying text.

³⁵ See *supra* note 2 and accompanying text.

ment is uncertain.³⁶ The identification of relevant alternative liability arrangements permits one to evaluate these alternatives through the eyes of the dependents.

Once the varying probabilities of alternative outcomes are recognized, one can develop measures of the expected value of each alternative compensation arrangement.³⁷ The value of each alternative compensation arrangement can be expressed in terms of the probability³⁸ of each outcome and the value of the outcome itself. For example, one possible compensation arrangement could provide that, in order to obtain compensation, the victim's dependents must prove carrier negligence. Under this arrangement two outcomes are possible. One, where the plaintiff is "successful" and obtains a settlement with a present value ("PVNCs") of \$80,000³⁹ and one where the plaintiff is unsuccessful and the settlement's present value ("PVNCn") is zero. Let us refer to the likelihood of each separate outcome as its "probability," termed "P", with P_s referring to the probability of a successful outcome and P_n referring to the probability of an unsuccessful outcome. Assume that the plaintiff receives an award in half of the cases. That is P_s is .50 and P_n is .50. We can express the overall expected award, "E(PVNC)", as the weighted average value of each outcome, with the weights being the

³⁶ See Sand, *supra* note 6 at 262. Sand states: "Without the Convention, common law liability rules would require the passenger to prove carrier's negligence unless 'the case speaks for itself' (*res ipsa loquitur*), which again could be rebutted by the carrier." *Id.*

³⁷ See Jacobs & Tompkins, *A Model of the Medical Malpractice Insurance Market*, 30 CPCU ANNALS 247 (1977).

³⁸ The probability of a specific outcome is the expected number of times that it will occur out of all the times it can occur. Thus, if there are 100 liability cases, and if forty-five cases result in awards, then the probability of a case resulting in an award is 0.45. In symbolic terms we can express the probability as "P" with subscript "s" for a "successful" outcome (i.e., an award received) and subscript "n" for the outcome where no award (i.e. an award of zero value) is received. It should be noted that if all cases result in either an award or in no award, then $P_s + P_n = 1$. Or if 30% of all cases result in an award, then 70% result in no award.

For an exposition of the application of probability analysis in a similar context see W. LUKSETICH & M. WHITE, *CRIME AND PUBLIC POLICY* 117 (1982).

³⁹ The current maximum award under the Montreal Agreement is \$58,000. See *supra* note 16 and accompanying text.

probability of each outcome occurring.⁴⁰

Assume that average compensation received in each successful suit is \$80,000 but that only one half of all suits result in awards (i.e., $P_s = .50$). Now, since no single plaintiff knows before the fact whether his case will be one of the successful ones, then each plaintiff has an expected value of compensation of \$40,000.⁴¹

It must be remembered that the above example was developed in the context of a specific set of numbers that correspond to a single set of liability arrangements. But with this framework, it becomes possible to compare the expected compensations among alternative liability arrangements. Let us now look at how a set of strict liability arrangements would compare. Under strict liability the victim's dependents are certain of an award; that is, the value of P_s is 1 and the value of P_n is 0. If the average value of the award were the same as the Montreal Agreement maximum (\$58,000), then the expected value of compensation to the dependents would be \$58,000.⁴² The actual compensation to those who do receive compensation under a strict liability system could in fact be much less than under an alternative system, yet the *expected* compensation could be greater.

C. A Maximum Award

A maximum award, "MAX", is a ceiling or limit on an award. In Article 22A of the Warsaw Convention one such limit is proposed.⁴³ The prime beneficiaries of such limits are the airlines and insurance companies. It should not be inferred that such limits necessarily hurt plaintiffs on average. Accompanying such limits may be increases in the probability of receiving such an award (as in the

⁴⁰ This is shown symbolically in equation 3: $E(PVNC) = P_s \times PVNC_s + (1 - P_s) \times PVNC_n$.

⁴¹ This is calculated, using Equation 3, *supra* note 40 as $[(.5 (80,000) + (.5)(0)] = 40,000$.

⁴² This is calculated as $[(1) (58,000) + (58,000)(0)] = 58,000$.

⁴³ See Warsaw Convention, *supra* note 2, art. 22(1).

case of strict liability under the Warsaw Agreement),⁴⁴ and more prompt settlements. This may mean larger expected values of compensation, because of the increased probability and promptness of receiving an award, and because of lower legal fees.

It is not our concern here with whether or not a maximum should be instituted. We are concerned only with the economic implications of any particular maximum award. We believe that a maximum should have an explicit economic basis. This would better enable one to evaluate it in terms of its fairness in compensating dependents for actual economic losses.

One such basis, which appears to be grounded in American policy proposals,⁴⁵ is that any maximum award should fully cover the losses⁴⁶ of eighty per cent of all beneficiaries. That is, that the value of MAX should be equal or exceed the value of PVNC for eighty per cent of the potential victims.

The selection of any single limit means that certain dependents will be precluded from the full economic value of losses. Those dependents whose losses exceed the maximum ("MAX") will, if compensated at a level of the maximum, be undercompensated by an amount equal to the difference between their loss and the maximum. If the maximum were set at \$58,000, a dependent who suffers losses valued at \$258,000 would be undercompensated by

⁴⁴ See *supra* note 36 and accompanying text.

⁴⁵ See *Protocol to the Convention on International Civil Aviation: Hearing Before the Senate Committee on Foreign Relations*, 95th Cong., 1st Sess. 71 (1977) (statement of Elias Saad and John R. Benn):

[The] second set of data represents the recovery levels that satisfied eighty per cent of all death and injury claims from 1966 through 1974. We selected this second group of figures based upon a policy consideration long espoused by CAB and state department. As early as the Montreal conference of 1966 our government has stated that any limit on air carrier liability was unacceptable unless eighty per cent of the affected claims could be satisfied within that limit.

Id.

⁴⁶ Our proposal is in terms of losses, not claims. There may not be any correspondence between claims and settlement, on the one hand, and losses, on the other.

\$200,000, if he received the maximum award. It appears reasonable that the selection of a maximum should be based on how many such dependents would be precluded from full compensation.

Based on airline passenger survey data, and using the techniques of loss estimation outlined in Section IIA of this article, we estimated the distribution of the size of the potential loss for United States airline passengers in 1983.⁴⁷ The results of these estimates are shown graphi-

⁴⁷ The information used to derive Figure 1 was gleaned from a survey conducted in 1984 for the Air Transport Association of America ("ATA") to obtain information about the incidence of flying on commercial airlines among a sample of the nation's adult population. 1984 Air Travel Survey, conducted by the Gallup Organization for the Air Transport Association of America, Washington, DC; 9, 10, 20, 21. Columns (1) and (2) below contain information on the proportion of the adult population that had flown within the last year on a commercial airline by family income intervals. Column (3) gives the midpoint of the income intervals. The mid-point of the open ended category is assumed to be \$50,000. Column (4) shows the total number of individuals out of 1,000 surveyed who were in the income interval. The number of the sample of 1,000 in the adult population who had flown in the last year (Column (1) \times Column (4)) is given in Column (5). The numbers in Column (5) are converted to proportions and are presented in Column (6). The proportions in Column (6) can be interpreted as the percent of those who fly on commercial airlines whose family income is in the particular income interval. For example, 27 percent of all airline passengers can be thought to have a family income between \$25,000 and \$39,000; 7 percent report income within the \$5,000 - \$9,999 interval. The midpoint of the income interval can be taken as an estimate of the gross income of a passenger within the income interval.

	(1)	(2)	(3)	(4)	(5)	(6)
1.	49%	\$40,000 and over	\$50,000	160	78	32%
2.	31%	25,000 - 39,999	32,500	216	67	27%
3.	28%	20,000 - 24,999	22,500	100	28	11%
4.	20%	15,000 - 19,999	17,500	160	30	10%
5.	19%	10,000 - 14,999	12,500	160	30	12%
6.	13%	5,000 - 9,999	7,500	121	16	7%
					244	99%

Column (7) shows the mid-point ages of those who had flown during the past year by income intervals deduced from data taken from the ATA Air Travel Survey. The numbers in Column (8) are remaining work-life estimates assuming a normal retirement age of 65 years. The mid-point income level and the remaining appropriate work-life estimates provide information for estimates of lost gross earnings over the work-life for an individual who earns that mid-point income and is killed in an airline accident. For example, individuals in the income level of \$25,000 - \$39,999 could be assumed to earn \$32,500 annually and have a work-life expectancy of 23 additional years. We can assume further that 27 percent of the victims

cally in Figure 1. In this figure we plotted the percent of passengers with potential losses at or below given amounts against potential values of losses (in thousands of dollars). According to our estimates, ten percent of all

in any airline accident earn \$32,000. If personal income taxes and personal consumption expenditures are assumed to follow the schedules presented in Columns (9) and (10) respectively, the net income that could have been available to dependents of individuals in the income intervals is given in Column (11). These personal income tax and personal consumption expenditure percentages are realistic for married individuals with two dependents in the upper income intervals. Of course, the low income intervals would not support a family of four. Keep in mind that the personal expenditure estimate is how much the decedent is thought to spend on himself personally, with all family expenditures such as housing, automobile, food, remaining the same.

	(7)	(8)	(9)	(10)	(11)	(12)
1.	55	10	23.5%	18%	\$31,365	\$313,650
2.	42	23	16.8	22	22,091	485,093
3.	29	36	10.6	26	14,885	535,860
4.	21	44	8.2	26	11,888	523,072
5.	21	44	5.0	38	7,363	323,972
6.	21	44	-	60	3,000	132,000

Column (12) gives the present value of the net income estimate shown in Column (11) projected to the end of the work-life shown in Column (8), with the assumption that the rate of growth of earnings over the work-life just equals the interest rate used to discount the future income stream to the present.

From Columns (6) and (12) the following schedule of economic losses by percentage of decedents incurring the losses can be deduced:

Percentage	Present Value (\$)
7.0	132,000
39.0	313,650
51.0	323,972
78.0	485,093
88.0	523,972
99.0	535,860

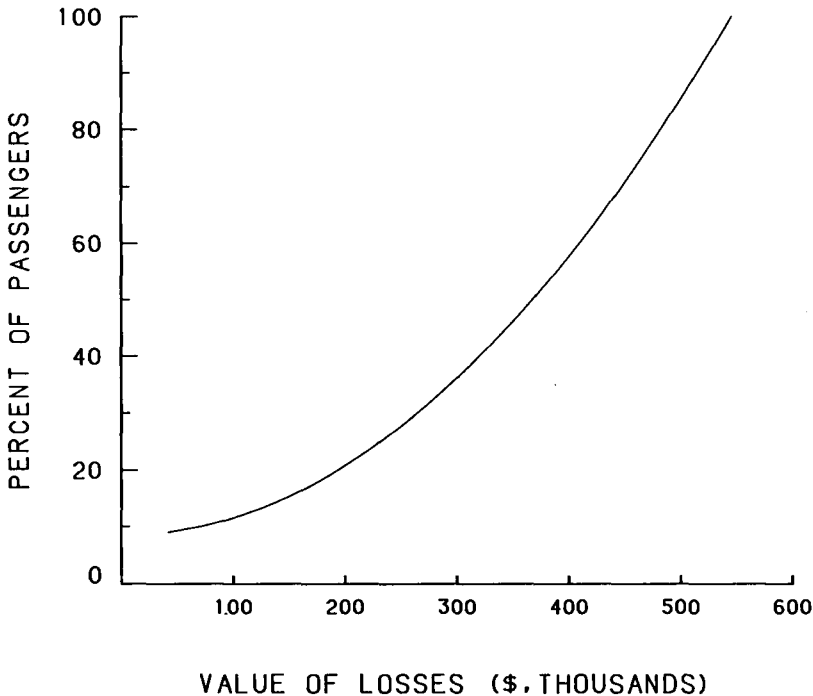
Based on this schedule, we estimated a smoothed out version using a statistical regression analysis, with the percent of passengers expressed as a function of the square of the loss value. This smoothed out version is displayed in Figure 1; some critical values of this version appear below:

Percentage	Present Value (\$)
20.0	196,000
40.0	324,000
60.0	414,000
80.0	488,000
90.0	521,000

dependents of passengers would suffer losses of \$72,000 or less in the event of death; 20 percent would suffer losses of \$196,000 or less; and so on.

FIGURE 1

Percent of passengers with potential
losses at or below a given amount



It can be seen that, according to these estimates, a maximum compensation of \$58,000 would fully cover under 10% of dependents' losses. One of \$300,000 would fully cover between thirty and forty percent of dependents' losses and leave the other sixty percent to seventy percent undercompensated. If the eighty percent rule were followed,⁴⁸ a limit of \$488,000 should be set.

It should be emphasized that these are estimates and

⁴⁸ See *supra* note 45 and accompanying text.

not actual figures. They are presented as a first approximation of the data which should be used in establishing a maximum. Surveys can be used to gather information to allow a more accurate approximation of potential loss distributions by passengers. Based on these estimates, the United States government (in this case) can establish that maximum award which explicitly meets its target levels for full compensation. Much of the arbitrariness which is now present in discussions concerning the appropriate maximum would be avoided.

III. INTERNATIONAL ASPECTS OF LIABILITY ARRANGEMENTS

There is a considerable difference between nations in average income levels and there is very likely a difference in income levels between residents or citizens of different nations who take international flights. In Table 2 we present data on "K", the expected economic loss of decedents who have 30 years remaining in the work force (24 in the case of the Central African Republic to account for lower life expectancies in this state), who are earning the average wage of a manufacturing employee in their state in terms of 1977 local monetary units, and who worked a full year.⁴⁹

What is striking about these figures is the considerable variation between averages among states, ranging from about \$11,000 for the Central African Republic to \$267,00 for the United States. Values of economic losses for other countries fall along the spectrum, and cannot easily be grouped in a non-arbitrary fashion.

While we have no data on potential losses of international airline passengers from different countries, it is likely that such differences exist, though they are not

⁴⁹ It was assumed that taxes and personal consumption reduced "K" below gross earned income by about twenty-five percent. These figures were translated into United States dollar terms using 1977 currency conversion rates. Rates of growth in net income ("V"), and personal consumption expenditures ("Q"), the increase factors, are assumed to equal the discount rate ("r"), the decrease factor.

TABLE 2

Values of economic Losses to dependents of manufacturing workers in selected countries US dollars, 1977 estimates

COUNTRIES	VALUE OF LOSS TO DEPENDENTS
United States	\$ 267,000
Federal Republic of Germany	263,000
Austria	174,000
Mexico	68,000
Cyprus	51,000
Ecuador	44,000
Kenya	39,000
Syria	32,000
Honduras	24,000
Malawi	12,000
Sierra Leone	12,000
Central African Republic	11,000

Source: Annual income for 1977 for manufacturing industries from INTERNATIONAL LABOUR OFFICE, YEARBOOK OF LABOUR STATISTICS 1980.
Average life expectancy from UNITED NATIONS DEMOGRAPHIC YEARBOOK 1979 Table 5. A value for working years remaining of 30 assumed except for Central African Republic, for which a figure of 24 was used. Conversion to US dollars based on 1977 average market exchange rates obtained from INTERNATIONAL MONETARY FUND, INTERNATIONAL FINANCIAL STATISTICS YEARBOOK 1980.

likely to be pronounced since there will be smaller proportion of residents who are international passengers in poorer nations.

Indeed, the international aviation law community has come to recognize the fact that such differences should be incorporated into the international compensation picture. The inclusion of domestic supplements in the Warsaw agreement,⁵⁰ along with the recognition that such supplements may vary among nations, is tantamount to the allowance for different maximums into a package that was once uniform.

From the viewpoint of economics, a variation in maximums among nations would make sense. For example, assume the passengers who are residents or nationals of Mexico had a distribution of potential losses that was very similar in shape to that of United States passengers, but was (allowing for some income difference) uniformly lower by 50%. In this case, the value of losses at each percentage point for the Mexican passengers would be 50 percent lower than for the United States passengers. If the Mexican government also chose an 80 percent cut off point,⁵¹ then it would choose a maximum of \$244,000 (half of the value which the United States government would choose).

More importantly, the existence of such differences in potential losses between countries, along with the extended period it has taken the international aviation legal community to respond to changes in price levels, has led to the inability of the American government to overcome objections from elements of the legal community and adopt the amendments. One approach to overcome these objections would be to adopt an alternative maximum formula with enough flexibility to allow individual countries to set maximums that would be acceptable to their government.

⁵⁰ See *supra* note 18 and accompanying text.

⁵¹ See *supra* note 45 and accompanying text.

IV. AN ECONOMIC APPROACH TO COMPENSATION

The primary objective of this article is to propose a compensation scheme that will allow equitable awards to dependents of victims of international airline accidents. Given the background of liability rules under the Warsaw Convention, the economic rationale for proper compensation in wrongful death litigation, and the international aspects of the current arrangements, we believe a compensation scheme should have the following objectives.

First, it should provide compensation which bears some relationship to the economic losses actually suffered. Second, it should be easily implemented. Third, it should be relatively unambiguous, so that maximum values can be determined without a great deal of controversy. Fourth, it should be flexible, so that it can accommodate changes such as inflation and the values of foreign currencies. With these objectives in mind, we propose that, instead of searching for a single number which will be applicable to residents of all countries, a general procedure be implemented which can be adhered to by the courts of all states when awarding compensation.

According to our proposed procedure, each government would be responsible for setting its own maximum liability level, which would be binding for residents or citizens of that country.⁵² The maximum should be based on a loss evaluation formula⁵³ (such as the one presented in this article) so that there would be an established relationship between actual losses and compensation.

The information needed for the implementation of this procedure would come from income surveys of citizens of each country who take international flights. Such surveys

⁵² The determination as to an individual's residence or citizenship would be left to the courts.

⁵³ It should be stressed that this proposal is concerned with the distribution of losses and the relationship of awards to these losses. Current discussion focuses solely on the distribution of awards while paying little or no attention to the losses for which the awards are made. See SENATE REPORT ON MONTREAL AVIATION PROTOCOLS, *supra* note 7.

could be conducted periodically (e.g., every two to five years) and could be done on a sample basis. Information gathered would include data such as age and income of a sample of international passengers who are residents of given countries. Based on this data, an estimate could be made of the distribution of losses of all potential passengers who are citizens or residents of a particular nation. This loss data could be reported in the currency of the nation of which the passengers are citizens or residents.

A cut off point, such as the eighty per cent cut off point used in our example, would be chosen (perhaps even agreed upon internationally). Based upon the potential distribution of losses, and the cut off point selected, a maximum award pertaining to the citizens or residents of each country could be established. For example, if the data presented in Section III were used for the United States, then a maximum award of \$488,000 would be selected for United States citizens and residents.

There are a number of benefits of such a system of setting a maximum. First, the award would be made in the currency of the nation of which the individual was a citizen or resident. This is the currency in terms of which losses are incurred. There would be no need to seek out a single international currency whose constantly fluctuating value would create added problems. Second, the living standard differences among passengers of different countries would be fully accounted for in the surveys, and a major source of controversy would be eliminated. Third, the maximum award could be updated regularly, either by conducting new surveys or by forecasting changes in the cost of living. The lag between changing living standards and the maximum award could be reduced considerably. Fourth, the maximum award would be based on actual data and judgements. The areas of controversy could be more explicitly brought out, and decisions may be reached more quickly.

It may well be that because of favorable liability rules (e.g., strict liability), early settlements, and thus low legal

fees, some adjustment might be made to lower the value of the maximum ("MAX") award, to take into account the fact that net benefits to the victims' dependents are greater under the proposed system. Such adjustments would be well within the spirit of our approach, but would recognize that the proposed system "economizes" on legal services.

IV. SUMMARY

The present system of international airline accident victim compensation, while attempting to reach the peak of simplicity, has become a tangled web. The attempt to develop a single maximum for all liabilities has created several insurmountable difficulties. First, because currencies fluctuate in terms of each other, there will always be losers (and gainers) when expressing awards in terms of any single currency. Second, because of the vast differences in incomes among nations, a single maximum could result in unfair limitations on awards to victims in high income nations. And third, because incomes (and therefore losses) have changed in value over time, there have been periods when the maximum award has precluded a considerable number of victims for receiving equitable compensation.

In this article, we have proposed an alternative arrangement, based on the belief that the award should bear some relationship to the actual economic loss incurred. According to our proposal, losses would be evaluated in terms of a standard procedure, which would recognize differences within as well as between countries. Compensation would bear some relationship to these losses, with appropriate recognition for the speed of settlement, the certainty of settlement, and the effect of these two variables on legal fees. If a maximum award is desired, then such a maximum should be calculated with explicit reference to the number of potential victims' dependents who will be excluded from full compensation for their economic losses. Consideration of such a scheme would move the entire debate on compensation for economic

losses in airline accidents into the area of what an appropriate settlement is, rather than in looking for a somewhat elusive single maximum.

