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To: Legislative Assistants, House Aviation Subcommittee
From: Representative Jim Lightfoot

RE: Background Information -- H.R. 1309, to Require the Use of Child Safety Restraint Systems
Aboard Aircraft

On Thursday, the House Aviation Subcommittee will review H.R. 1309, legislation I have introduced requiring the Secretary of Transportation to enter into rulemaking to require infants to be restrained in flight.

I first became involved in this issue in 1989 after the United Airlines crash in Sioux City, Iowa, which claimed the life of a toddler who might have been saved had he been restrained. Sadly, the Avianca crash in New York followed upon Sioux City, with seven children injured - one of whom died. In 1994, a baby girl was thrown from her mother's lap in the US Air crash in Charlotte, NC, and died. In both cases the mothers survived because the FAA insists that they be restrained while in flight. Both were instances where the National Transportation Safety Board determined a child safety seat would have saved the child's life.

Airline crashes are not the only occasions where child safety seats can protect infants. There are also numerous cases of sudden clear air turbulence throwing children seated in their parents' laps into the air. One American Airlines flight from Miami to San Francisco encountered turbulence so severe that 26 people were injured. Among those injured -- two toddlers thrown from their parent's laps. Perhaps the saddest turbulence accident was a flight that experienced severe turbulence on approach to San Juan. The only injury -- a skull fracture to a seven week old lap child.

FAA Opposition Based on Bad Assumptions

The FAA continues to oppose this legislation based on, I believe, questionable studies which essentially conclude that mandating infants be restrained while in flight would, in fact, cost more lives than it would save. **I believe that argument, and how the FAA supports it, through a series of studies of dubious worth, is the essential issue that I hope the Subcommittee will examine.**

In 1990, the FAA appeared before the House Aviation Subcommittee with its first study, performed on a contract basis by Apogee Research, Inc. The study concluded that required use of child safety seats would cost more lives than it saved. The FAA sprung the study on the Subcommittee that morning with no chance for advance review. For the record we asked the NTSB to review the FAA study. In their response to the Committee the NTSB concluded:

"The Board found several errors in the study's analysis of fatalities and injuries to children under two years old who are permitted to be held in the laps of an adult in aviation accidents and incidents; probably because it was prepared by persons who had no knowledge of aircraft crashworthiness, kinematics and injury mechanisms. Thus the study's basic assumptions, which are based interpretations of accidents, must be viewed with skepticism."

The Board went on to say:

"Thus, the Safety Board believes that the sample of accidents examined by Apogee was not a valid sample to demonstrate the effectiveness of child safety seats."

The credibility of the Safety Board's view of the 1990 and subsequent 1993 Apogee study were at least partially confirmed in 1994 during a panel discussion convened by the FAA. The panel noted that Apogee's assumptions on automobile infant fatality rates in cars were wrong. Obviously, that kind of error will have dramatic effects on the conclusions reached by any study.

In response to Public Law 103-305, in May 1995, the Department of Transportation (DOT) released a two volume study entitled "Child Restraint Systems." Not surprisingly, the study continues to endorse the FAA's misguided position.

The DOT offers an impressive economic model in attempt to support its position. However, like leasing a car, you need to read the fine print. For example, the report states:

"Also, most information and data used for the quantitative analysis were gathered from previous government and academic research. Because researchers from different topic areas produced the information, it sometimes had to be modified to fit the specific needs of this project. Occasionally the data and information were incomplete and had to be extrapolated to meet the needs of this study."

I have also asked the NTSB to review this latest DOT report. Attached is a copy of the NTSB's full response. The NTSB review of the study concluded:

"Consequently, the Safety Board believes that the FAA's projected costs to air travellers, revenue losses to airlines and passenger diversions to automobiles as a result of mandates child restraint systems for infants are based upon incomplete analysis."

The NTSB view is seconded by noted transportation expert Darryl Jenkins, who has concluded the DOT's latest study has reached the wrong conclusions about the use of child safety seats because its lack of understanding of the aviation industry led to the use of the wrong statistical measurements in determining whether families would switch to automobiles.

Further, there are other views on this issue which lead us in another direction. A report commissioned by the Association of Flight Attendants entitled: "A Reexamination of Economic Arguments on requiring Restraints for Children Under Age Two In Commercial Aircraft" drew these critical conclusions:

"There are no valid economic reasons to believe the conclusions drawn by the FAA have a basis in fact. Therefore, the contention that requiring restraints for children age two would result in greater death or injury is unsupported. The arguments used by those who support this policy fail to take into account the low cost carriers and their importance in short-haul traffic. Therefore, it cannot be argued that a child restraint requirement would prompt adults with infants to fly rather than drive."

Additional Points of Consideration

1) **Does every passenger on an airplane deserve the same level of protection?** The FAA can say whatever it wants but the simple fact remains that current regulations afford passengers two different levels of safety. It's not right that luggage and pets have to be safely secured but our children do not.

2) **How valid are FAA's studies?** The FAA has offered us nothing more than a series of studies, which, as they are discredited, are simply replaced by new ones reaching the same conclusions. The ValuJet crash showed us many things, one of which is the fact the FAA does not understand the effects of the low cost carriers on the airline market -- yet the FAA asks Congress to accept the results of studies based on the FAA's understanding of the airline industry.

3) **Is FAA's position regarding child safety seats consistent with other safety regulations?** I hope the Subcommittee will ask the FAA to provide Congress today with a list of how many lives have been saved recently by requiring air carriers to carry life rafts and life vests. The answer, to my knowledge, is zero. Applying the FAA's twisted cost benefit logic from child safety seats to other

equipment we see that we can eliminate other safety equipment.

4) **Can the market adjust to requiring the use of child safety seats?** I have great faith that when Congress makes the policy decision that all passengers deserve the same level of airline protection -- the market will adjust. Innovative solutions are on the way. For example, Thomas Bennington, is proceeding to the testing phase of a child safety seat which fits in front of the passenger. It may or may not be the solution, but the airlines are not going to risk losing billions of dollars worth of family travel business. And let's ask the FAA, the new expert in aviation demographics, one question: How many families stop flying once their child turns two?

Conclusion

The Aviation Subcommittee has a great tradition of demanding more in terms of safety from the FAA than sometimes it was prepared to give.

The travelling public takes for granted floor level lighting, protective breathing devices, smoke detectors and collision alert and avoidance systems. But I know who pushed those things first and it was the House Aviation Subcommittee. So let me urge you to take the lead one more time by closing another loophole in aviation safety.

Questions for the Record
from Mr. Lightfoot

Mr. Lightfoot. Last year the FAA once again failed to act on an urgent NTSB recommendation, the mandated use of child safety seats on aircraft. During last year's hearing, I requested NTSB provide to the Subcommittee an analysis of FAA's latest work on this subject, "Report to Congress, Child Restraint Systems," May 1995. For the record, would NTSB please provide the Subcommittee with this analysis.

[The information follows:]

On June 7, 1995, the FAA released a two-volume report to Congress entitled "Child Restraint Systems" (CRS). The Safety Board recognizes that the FAA expended considerable time and resources to develop this report, which concluded that mandating CRS on air carrier flights could result in some passenger diversions to automobiles, resulting in a net decrease in safety.

The scenarios proposed by the FAA that result in passenger diversions to automobiles and a net safety reduction are based on the premise that substantially higher air fares for families traveling with children will create those diversions. These diversions are based on the FAA's elasticity estimates that characterize families traveling with children as being highly price sensitive.

Given the FAA's assumed price sensitivity for these travelers, the Safety Board believes that if airlines were to charge a substantial fare for infants who currently are traveling free, the initial reduction in air travel by families would result in a substantial revenue loss for airlines, causing them to incur the FAA study's revenue loss estimate of up to \$6 billion over a 10-year period. However, the Safety Board is certain that the airlines will not let \$6 billion worth of price-sensitive travelers shift to the automobile without a competitive response. Airlines could offer any number of innovations to keep the families flying, such as free seats for infants or group discounts. The FAA study recognizes this likelihood in a passage that states, "Air carriers are expected to charge for infants only with the possibility of minimal passenger diversions and no net loss of revenues. Those charges would occur during peak travel seasons [when the report predicts families are least

likely to switch to automobiles] and peak periods of the day. [Families] may be offered significant infant fare discounts or free infant passage during off-peak periods." (p. 7-1)

In testimony before the U.S. House of Representatives on July 20, 1990, the Vice President of Operations for the Air Transport Association stated that with regard to potential passenger diversion to automobiles, air carriers "rather than risk the loss of one or more adult fares or perhaps an entire family unit, will offer a fare arrangement acceptable even for families traveling with infants who previously would have flown free."

The airlines are likely to permanently impose higher fares for infants only if they discover that the families traveling with infants are less price sensitive in practice than anticipated by the FAA. In that event, again, there would be limited diversion of passengers to automobiles and the added risk of automobile accidents.

The Safety Board notes that the FAA study selected what it labeled "Scenario Number 4" as the CRS option that prevented the most injuries and fatalities, with the least economic impact to air carriers. The study describes this scenario as one in which a family could reserve a seat for an infant traveler on a space-available basis, providing their own CRS. The Safety Board observes that this scenario is functionally identical to the current situation, in which airlines permit families to secure CRS on empty seats, when available. Thus, Scenario 4 would result in no net safety improvement.

Consequently, the Safety Board believes that the FAA's projected costs to air travelers, revenue losses to airlines, and passenger diversions to automobiles as a result of mandated CRS for infants are based upon incomplete analysis.

The Safety Board also notes the FAA's intention to develop a nationwide public education campaign to promote the use of child restraints. The Board believes that this campaign is appropriate. The Safety Board does not, however, believe that education alone will result in the protection of infants and small children on airplanes. Education alone did not result in high usage of CRS in automobiles; consequently, all 50 States and the District of Columbia now have

mandatory automobile child restraint laws. The Safety Board is pleased to learn that Secretary Peña has written to air carriers asking that they establish incentives that encourage parents to fly with properly restrained children; the discount fares offered by Southwest Airlines to children who use CRS are consistent with such efforts.

Safety Recommendation A-95-51 is classified "Open - Unacceptable Response."

JIM LIGHTFOOT

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Child Safety Seat Saves Another Life

Cosponsor H.R. 1309

July 31, 1996

Dear Colleague:

I hope you will join me as a co-sponsor of H.R. 1309, legislation to require the use of child safety restraint systems on commercial aircraft.

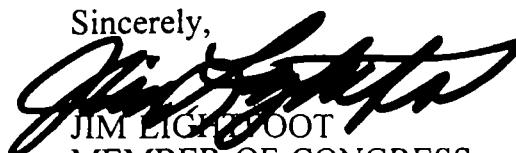
In early July of this year a child safety restraint system on an airline saved another life. A child seat prevented engine shrapnel from harming a young girl on Delta Flight 1288 when the engine exploded upon takeoff. Currently, Federal Air Regulations do not require infants under the age of two to be in a restraint system while in flight. Time and time again this shortsighted policy has led to tragic consequences. Many remember airline disasters in Charlotte, NC, and Sioux City, IA, in which infants were killed. In both tragedies child restraint systems were not utilized, and in both instances the National Transportation Safety Board determined a child restraint system would have saved the infants' lives. Adults are required to wear safety belts; our luggage is required to be stored. Yet, our most vulnerable passengers are exempt from basic safety requirements.

Continually, the FAA defends its misguided policy based on a study which concluded that mandating child restraint systems on air carrier flights would result in passenger diversions to automobiles resulting in a net decrease in safety. The National Transportation Safety Board has reviewed the FAA's study and concluded "**the FAA's projected costs to air travelers, revenue losses to airlines and passenger diversions to automobiles as a result of mandated child safety restraints for infants are based on incomplete analysis.**"

The National Transportation Safety Board, the Association of Flight Attendants, SafetyBeltSafe U.S.A. and the Airline Pilots Association all strongly support the required use of child safety restraint systems on commercial aircraft.

I hope you will join me as a co-sponsor of this important legislation. Please contact me, or Ian Thompson of my staff, at 5-3806 to become a co-sponsor.

Sincerely,


JIM LIGHTFOOT
MEMBER OF CONGRESS

WILLIAM O. LIPINSKI

30 DISTRICT, ILLINOIS

COMMITTEE ON
TRANSPORTATION AND INFRASTRUCTURERANKING DEMOCRATIC MEMBER
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June 18, 1997

The Honorable John J. Duncan
Chairman
House Subcommittee on Aviation
2251 Rayburn House Office Building
Washington, D.C. 20515

Dear Mr. Chairman:

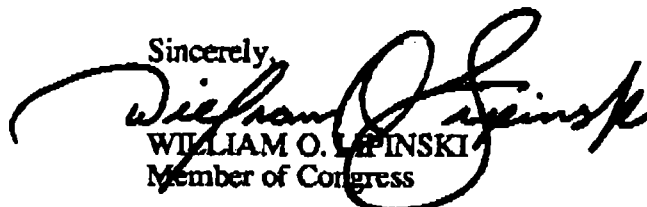
I am writing to request a Subcommittee mark-up of two pieces of important safety legislation -- H.R. 915, the Aviation Safety Protection Act of 1997, and H.R. 754, a bill to require child safety restraint systems on commercial aircraft. Both pieces of legislation serve to increase aviation safety for the traveling public.

H.R. 915, the Aviation Safety Protection Act of 1997, was introduced by Congressman Sherwood Boehlert (R-NY) and Congressman James Clyburn (D-SC) and currently has 53 bi-partisan co-sponsors. As you may recall, the Subcommittee held a hearing on this important legislation in the 103rd Congress. This bill will provide whistleblower protection to airline employees who report safety violations by their employers to the federal government. In addition, the bill protects the airline industry from frivolous complaints by establishing a fine if the complaint has no merit.

H.R. 754 was introduced by Peter DeFazio (D-OR) and Christopher Shays (R-CT) and currently has 51 bi-partisan co-sponsors. This bill would require the use of child restraint systems on commercial aircraft. Although regulations exist to restrain coffee pots and carry-on baggage, current regulations do not require our youngest passengers to be in a restraint system while in flight. This measure is endorsed by the National Transportation Safety Board, the White House Commission on Aviation Safety and Security, the Association of Flight Attendants, the Airline Pilots Association and several others in the airline industry.

I believe both these bi-partisan, safety related bills warrant action by the Subcommittee. I look forward to working with you on this and other matters of concern. As always, I appreciate your assistance and cooperation.

Sincerely,



WILLIAM O. LIPINSKI
Member of Congress

A REEXAMINATION OF ECONOMIC ARGUMENTS ON REQUIRING RESTRAINTS FOR CHILDREN UNDER AGE TWO IN COMMERCIAL AIRLINES

by

Darryl Jenkins

Commissioned by: Association of Flight Attendants
1625 Massachusetts Ave., NW
Washington, DC 20036
May 3, 1995

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EXECUTIVE SUMMARY

Each year, millions of infants and small children under two years of age take flight aboard U.S. commercial aircraft, often riding in the lap of a parent or guardian. These littlest of passengers are the only individuals for whom there is no requirement of being restrained, placing them at greater risk of death or injury in an aircraft accident or turbulence.

In response to calls for a child restraint requirement for all small children traveling as air passengers, the Federal Aviation Administration (FAA) issued a notice of proposed rulemaking in 1989 entitled "Miscellaneous Operational Amendments." This notice included a proposal that would allow parents to use approved child restraints on commercial aircraft, but stopped far short of requiring the use of child restraints. The need for proper restraint of children has been recognized by aviation safety engineers for more than thirty years, however.

Currently, infants can fly for free when traveling on the lap of a parent or a guardian. The FAA's argument

against a requirement for restraining infants and small children is that if parents have to pay for a seat in which to restrain an infant, fewer people will choose to fly and more will travel by car, which is less safe. We refer to this as the price "elasticity of demand argument", or price sensitivity.

In response to FAA's position, we have undertaken this study to critically examine the underpinnings of this policy. Our study finds four key shortcomings in the FAA's modeling assumptions:

1. Lack of key data to determine price sensitivity,
2. The use of an industry demand curve that unrealistically simplifies a complex situation,
3. A failure to take into account the price competition generated by low-fare carriers,
4. A failure to take into account the effects of income sensitivity.

Because of these four factors, we conclude that invalid assumptions have been used to decide this policy issue. From our study, we have concluded the following:

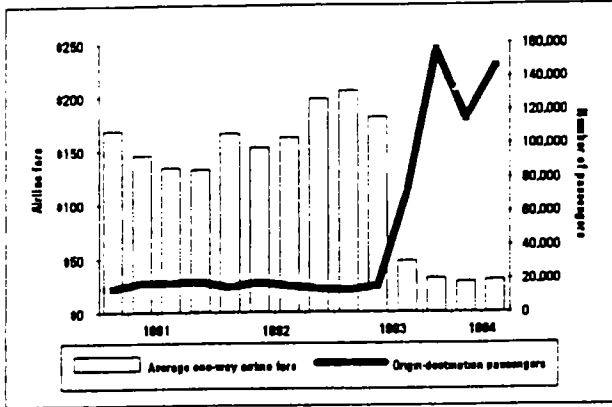
1. There are no valid economic reasons to believe that the conclusions drawn by the FAA have a basis in fact. Therefore, the contention that requiring restraints for children under age two would result in greater death or injury is unsupported.

2. The arguments used by those who support this policy fail to take into account the low-cost carriers and their importance in short-haul traffic. Therefore, it cannot be argued that a child restraint requirement would prompt adults with infants to drive rather than fly. In fact, the attractive fares offered by low-cost carriers could coax additional passengers into the air even if the child-restraint requirement were to be implemented.

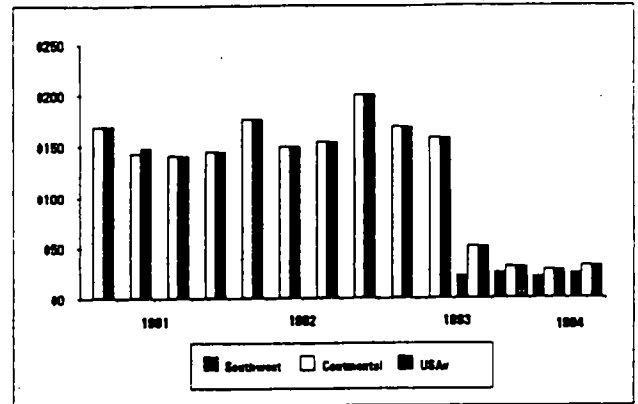
APPENDIX A:

EIGHT SELECTED MARKETS WITH LOW-FARE AIRLINE SERVICE

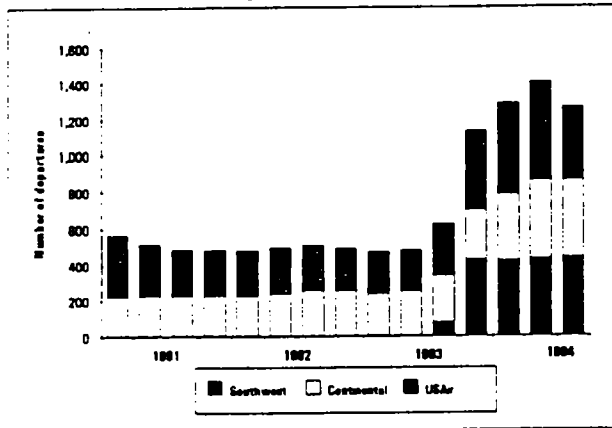
**Fare Stimulated Increase in
Origin-Destination Passengers**



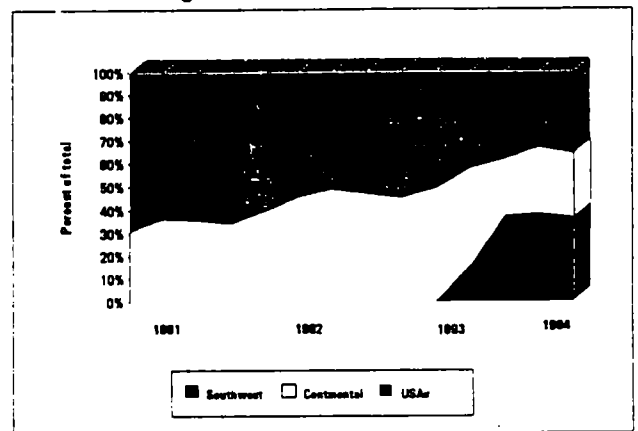
Fare Response of Established Airlines



Service Response of Established Airlines



**Change in Airline Market Shares
of Origin-Destination Passengers**

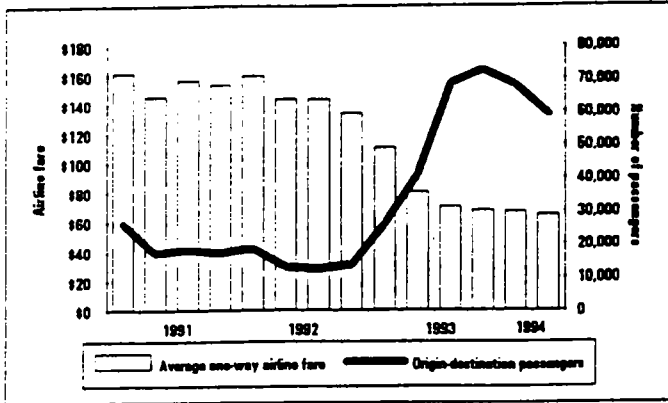


Sources: U.S. Department of Transportation/Air Transport Association of America, Origin-Destination Survey of Airline Passenger Traffic, Domestic, CD-ROM database, quarterly data for years noted and Form 41, Schedule T-100, CD-ROM database, quarterly data for years noted.

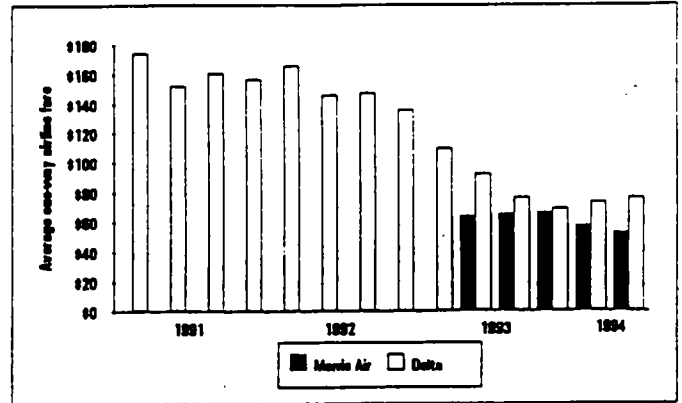
Exhibit A

**LOW-FARE AIRLINE MARKET:
CLEVELAND TO BALTIMORE**

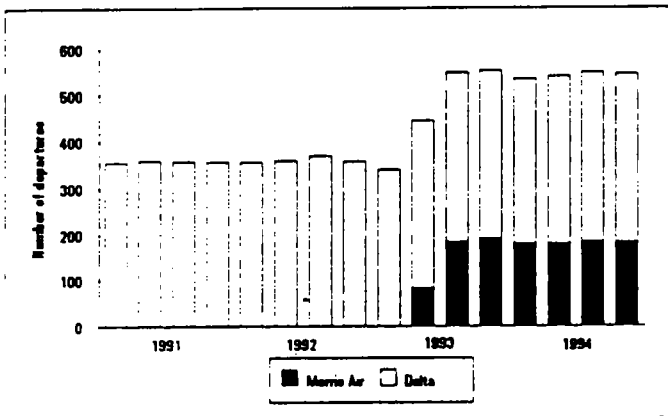
Fare Stimulated Increase in Origin-Destination Passengers



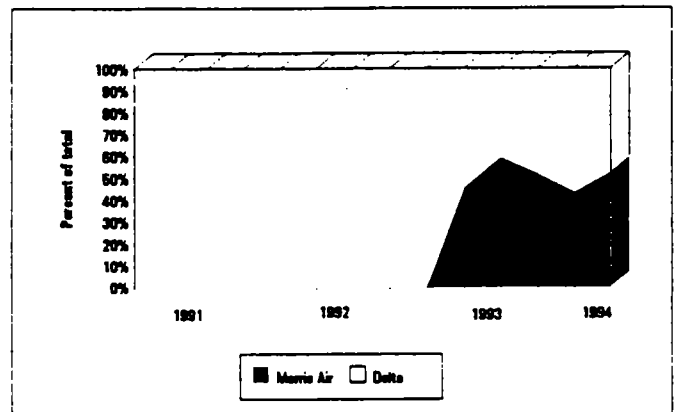
Fare Response of Established Airlines



Service Response of Established Airlines



Change in Airline Shares of Origin-Destination Passengers

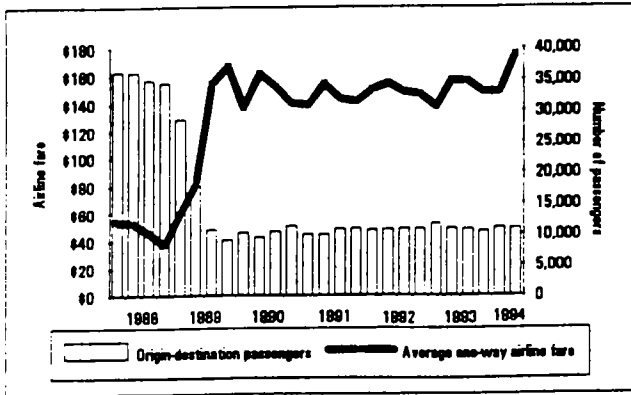


Sources: U.S. Department of Transportation/Air Transport Association of America, Origin-Destination Survey of Airline Passenger Traffic, Domestic, CD-ROM database, quarterly data for years noted, and Form 41, Schedule T-100, CD-ROM database, quarterly data for years noted.

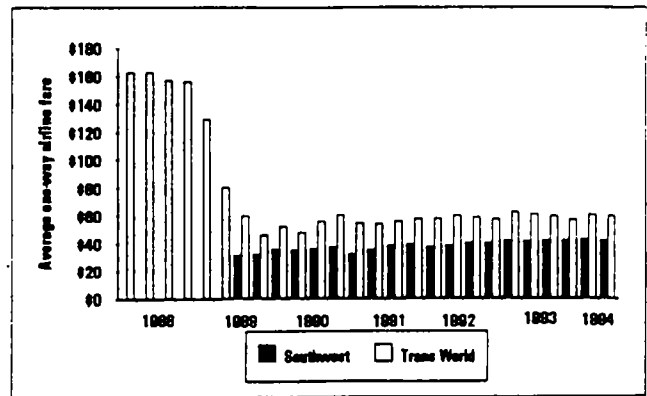
Exhibit B

**LOW-FARE AIRLINE MARKET:
SALT LAKE CITY TO SAN DIEGO**

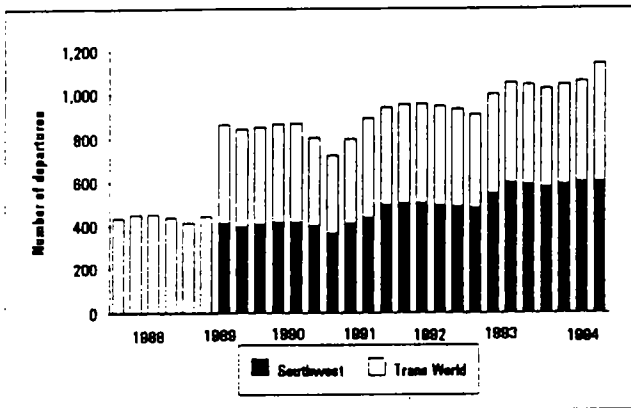
Fare Stimulated Response in Origin-Destination Passengers



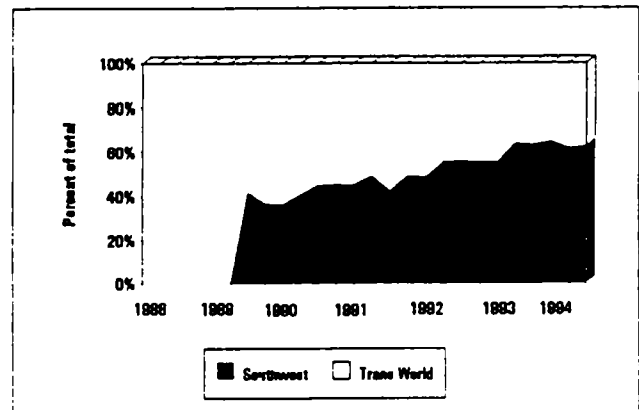
Fare Response of Established Airlines



Service Response of Established Airlines



Change in Airline Market Shares of Origin-Destination Passengers

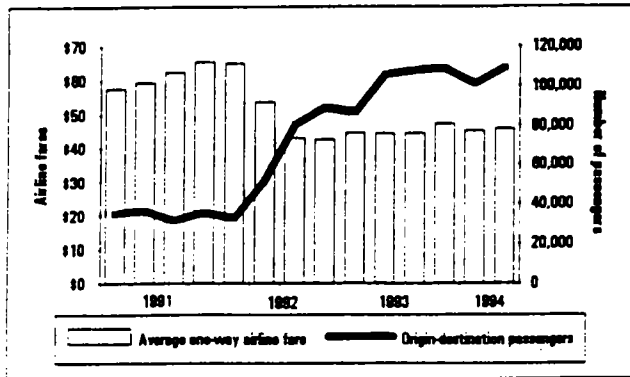


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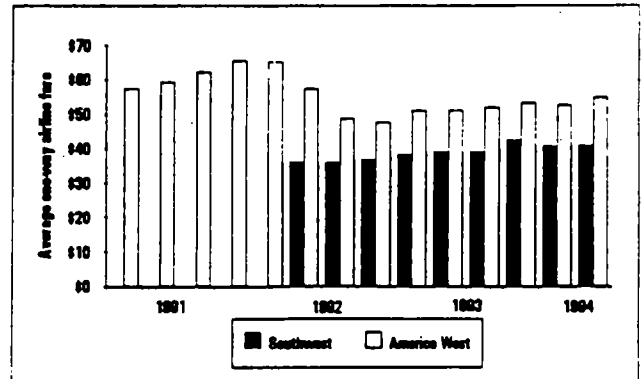
Exhibit C

LOW-FARE AIRLINE MARKET:
ST. LOUIS TO INDIANAPOLIS

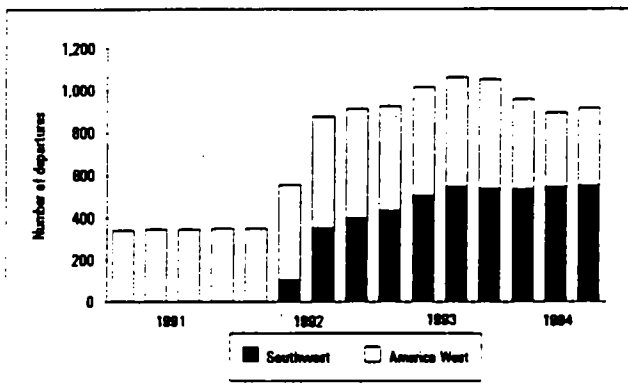
Fare Stimulated Response in Origin-Destination Passengers



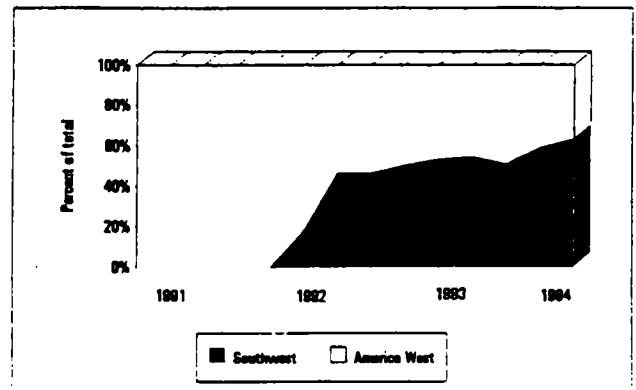
Fare Response of Established Airlines



Service Response of Established Airlines



Change in Airline Market Shares of Origin-Destination Passengers

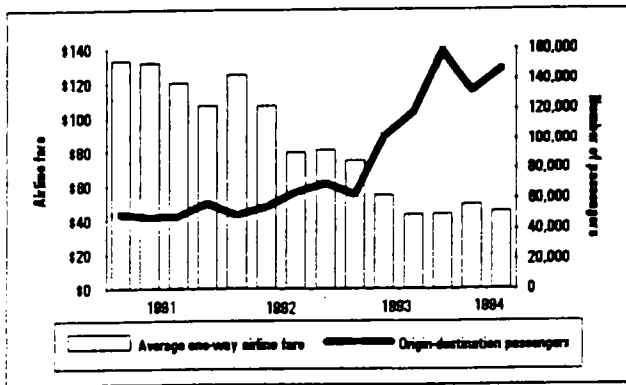


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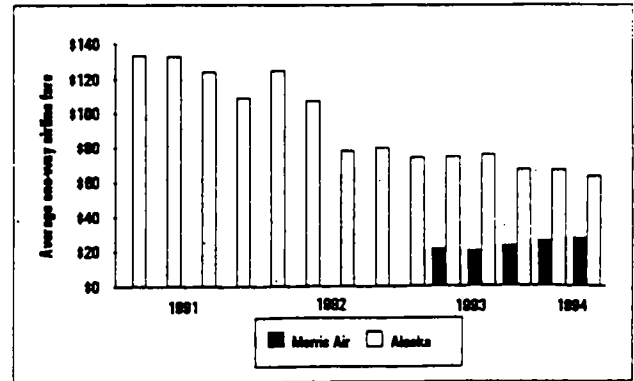
Exhibit D

LOW-FARE AIRLINE MARKET:
PHOENIX TO BURBANK

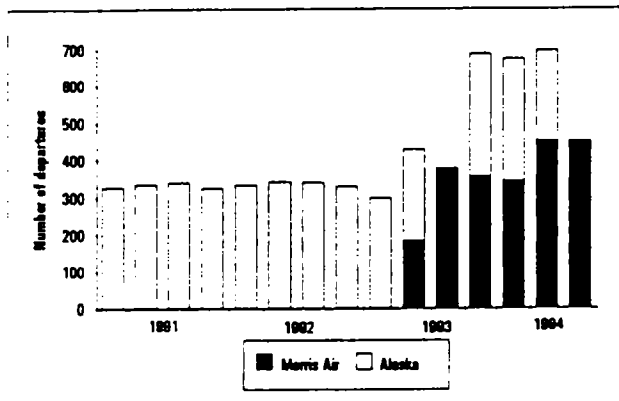
Fare Stimulated Response in Origin-Destination Passengers



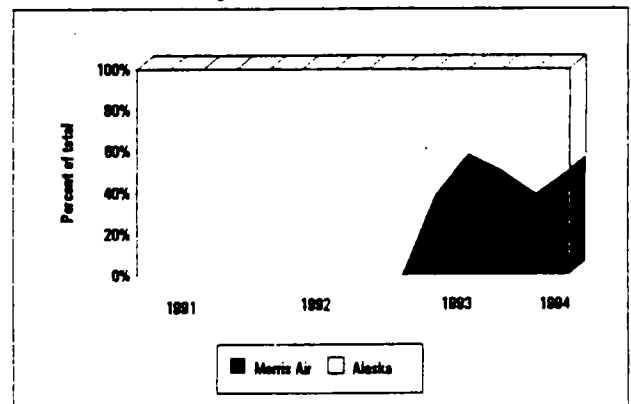
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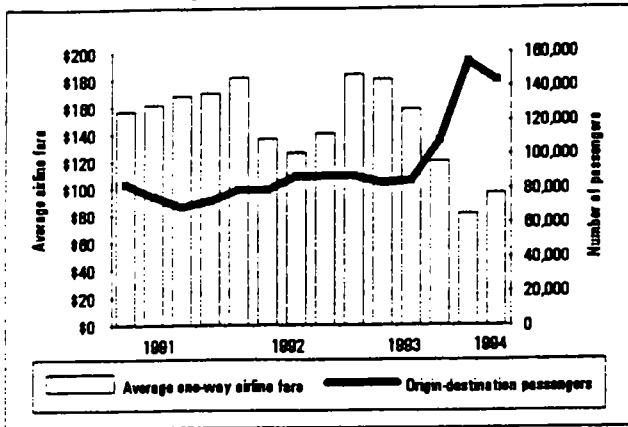


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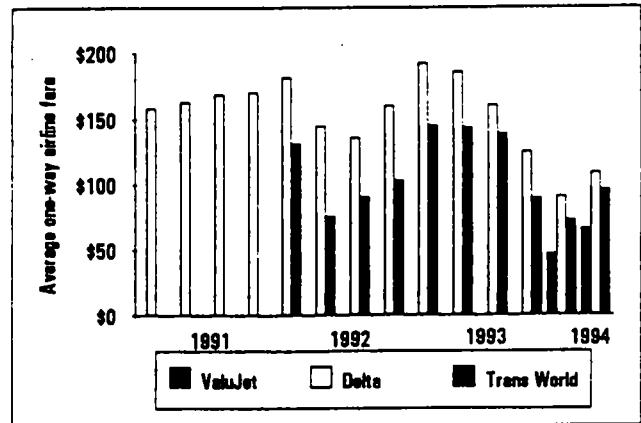
Exhibit E

LOW-FARE AIRLINE MARKET:
SEATTLE TO SPOKANE

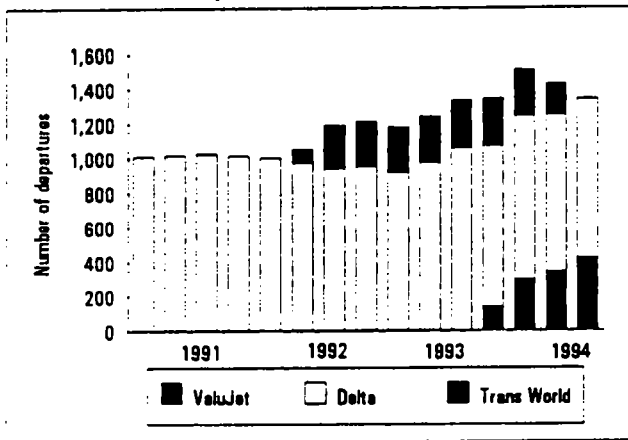
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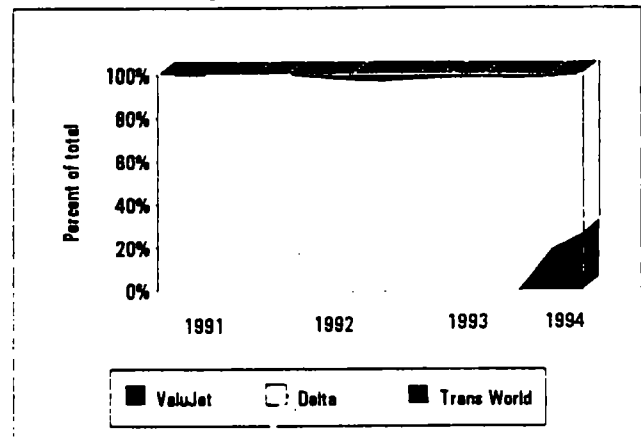
Fare Response of Established Airlines



Service Response of Established Airlines



**Airline Market Shares
of Origin-Destination Passengers**

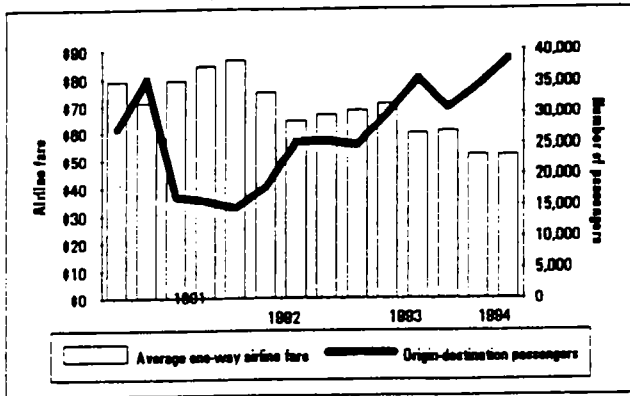


Sources: U.S. Department of Transportation/Air Transport Association of America, Origin-Destination Survey of Airline Passenger Traffic, Domestic, CD-ROM database, quarterly data for years noted and Form 41, Schedule T-100, CD-ROM database, quarterly data for years noted.

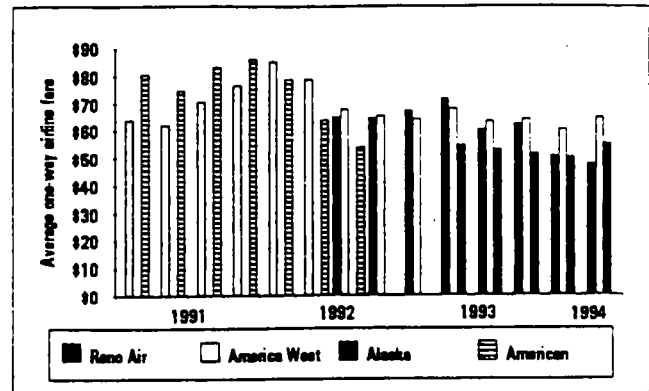
Exhibit F

**LOW-FARE AIRLINE MARKET:
ATLANTA TO ORLANDO**

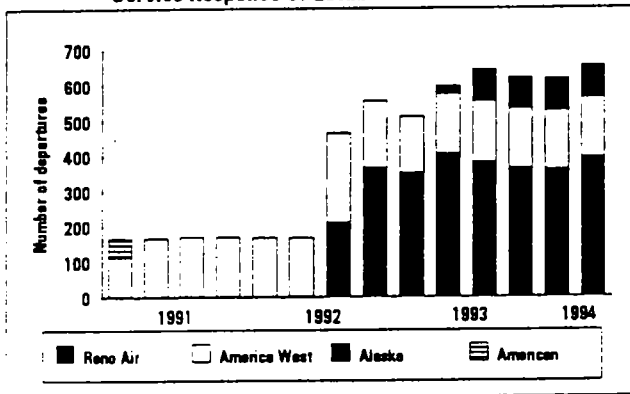
**Fare Stimulated Increase in
Origin-Destination Passengers**



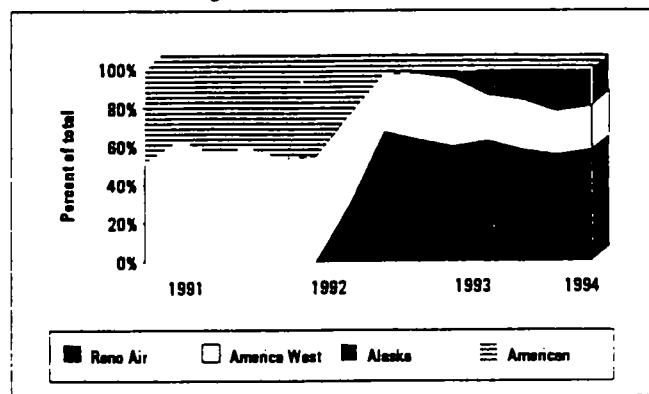
Fare Response of Established Airlines



Service Response of Established Airlines



**Change in Airline Market Shares
of Origin-Destination Passengers**

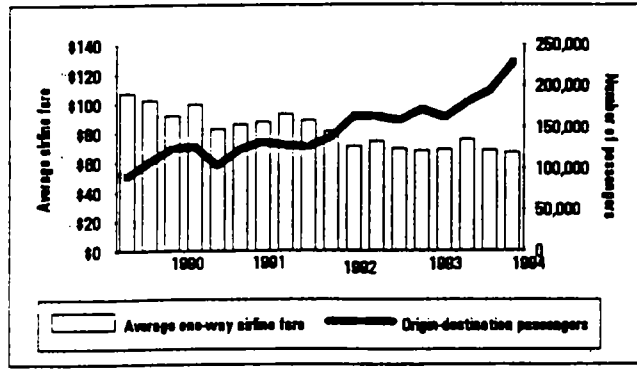


Sources: U.S. Department of Transportation/Air Transport Association of America, Origin-Destination Survey of Airline Passenger Traffic, Domestic, CD-ROM database, quarterly data for years noted and Form 41, Schedule T-100, CD-ROM database, quarterly data for years noted.

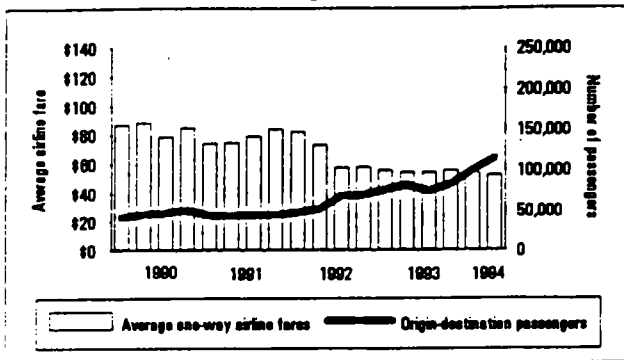
Exhibit G

LOW-FARE AIRLINE MARKET:
RENO TO PORTLAND

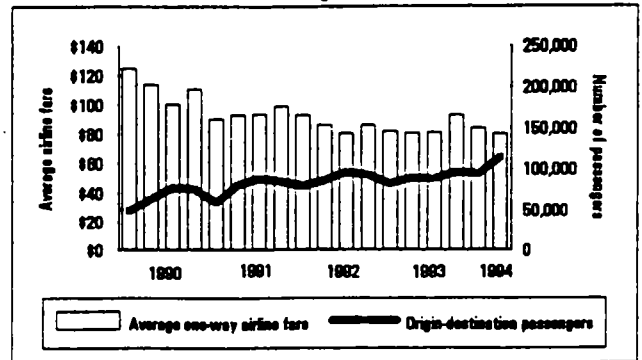
**The Francisco Hub: Fare Stimulated
in Origin-Destination Passengers**



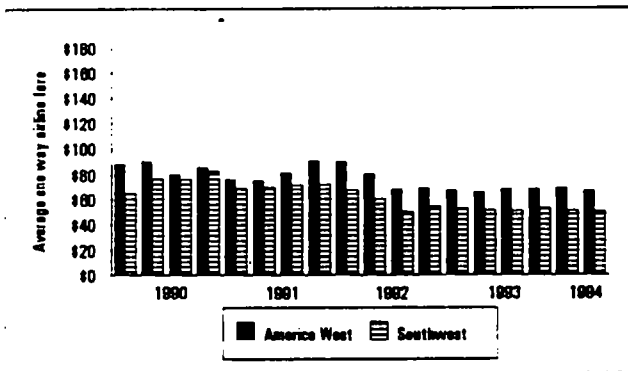
**Metropolitan Oakland Airport:
Fare Stimulated Increase in Origin-Destination Passengers**



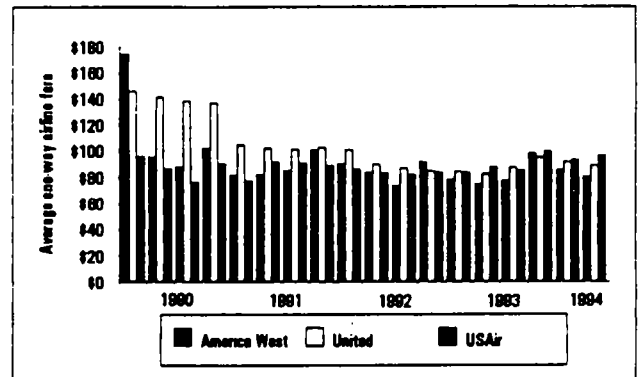
**San Francisco International Airport:
Fare Stimulated Increase in Origin-Destination Passengers**



**Metropolitan Oakland Airport
Fare Response of Established Airlines**



**San Francisco International Airport
Fare Response of Established Airlines**

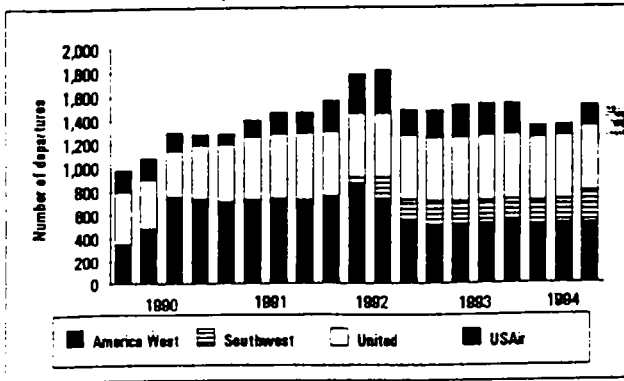


Sources: U.S. Department of Transportation/Air Transport Association of America, Origin-Destination Survey of Airline Passenger Traffic, Domestic, CD-ROM database, quarterly data for years noted, and Form 41, Schedule T-100, CD-ROM database, quarterly data for years noted.

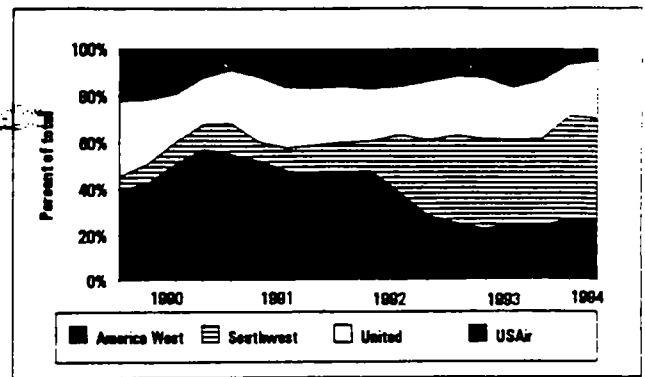
Exhibit H (page 1 of 2)

**LOW-FARE AIRLINE MARKET:
LAS VEGAS TO OAKLAND**

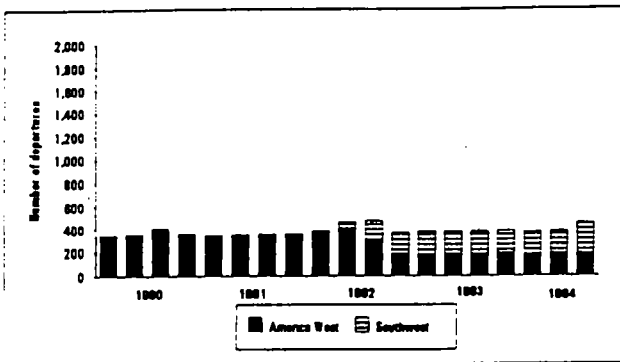
**1 Francisco Hub:
Service Response of Established Airlines**



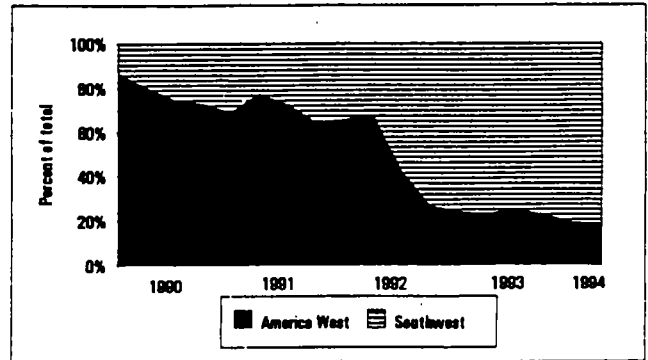
**The Francisco
Airline Market Shares of Origin-Destination Passengers**



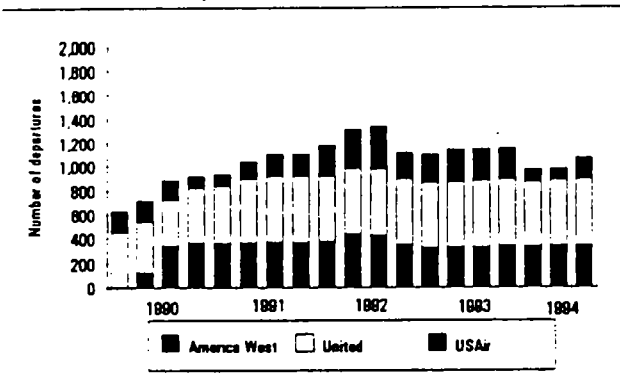
**Metropolitan Oakland Airport:
Service Response of Established Airlines**



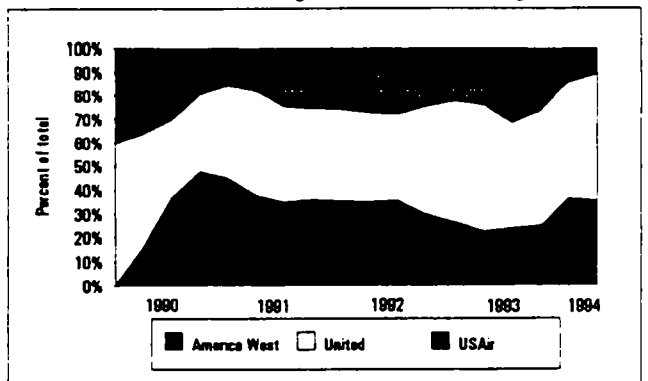
**Metropolitan Oakland Airport:
Airline Market Shares of Origin-Destination Passengers**



**San Francisco International Airport:
Service Response of Established Airlines**



**San Francisco International Airport:
Airline Market Shares of Origin-Destination Passengers**



Sources: U.S. Department of Transportation/Air Transport Association of America, Origin-Destination Survey of Airline Passenger Traffic, Domestic, CD-ROM database, quarterly data for years noted, and Form 41, Schedule T-100, CD-ROM database, quarterly data for years noted.

Exhibit H (page 2 of 2)

**LOW-FARE AIRLINE MARKET:
LAS VEGAS TO OAKLAND**

regulations, they are working to ensure that our aviation system remains safe and secure. Their responsibilities at times require them to confront passengers who are unwilling to comply with lawful instructions and become abusive. Such conduct by passengers threatens the well-being of all those on the plane, and is subject to federal prosecution. The Commission urges the DOT to work with the Department of Justice and the United States Attorneys to ensure that priority is given the prosecution of offending passengers to the fullest extent of the law for interfering with airline crew members in the performance of their duties.

1.12. Legislation should be enacted to protect aviation industry employees who report safety or security violations.

In a number of important industries, statutory protection is provided to "whistleblowers" who report violations of safety procedures. The Commission believes that aviation safety and security will be enhanced if employees, who are a critical link in safety and security, are able to report unsafe conditions to the FAA without fear of retribution from their employers. Some aviation employees are provided protections through contractual agreements. However, the Commission believes that statutory protection, such as that provided to workers under the Occupational Health and Safety Act, would provide uniformity within the industry and provide coverage to those not already protected.

1.13. The FAA should eliminate the exemptions in the Federal Aviation Regulations that allow passengers under the age of two to travel without the benefit of FAA-approved restraints.

Current regulations require that all passengers over the age of two have their own seats, and that those seats are equipped with FAA-approved restraints. The Commission believes that it is inappropriate for infants to be afforded a lesser degree of protection than older passengers. The FAA should revise its regulations to require that all occupants be restrained during takeoff, landing, and turbulent conditions, and that all infants and small children below the weight of 40 pounds and under the height of 40 inches be restrained in an appropriate child restraint system, such as child safety seats, appropriate to their height and weight. The Commission also notes and commends the FAA's ongoing efforts in collaboration with major airframe and seat manufacturers to develop standards for integrated child safety seats.

GORE COMMISSION

-15-

Feb 12, 1997

Wt Commission on
Aviation Safety and
Security

VP
AL
Gore

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NEWS from U.S. Senator

PATTY MURRAY

— Washington • Democrat —

**FLOOR STATEMENT BY U.S. SEN. PATTY MURRAY (D-Wash.)
ON AIRLINE CHILDREN'S SAFETY BILL
March 5, 1997**

I rise today to introduce legislation that would protect our nation's small children as they travel on aircraft. We currently have federal regulations that require the safety of passengers on commercial flights. However, neither flight attendants nor an infant's parents can protect unrestrained infants in the event of an airline accident or severe turbulence. A child on a parent's lap will likely break free from the adult's arms as a plane takes emergency action or encounters extreme turbulence.

This child then faces two serious hazards. First, the child may be injured as they strike the aircraft interior. Second, the parents may not be able to find the infant after a crash. The United/Sioux City, Iowa crash provides one dark example. On impact, no parent was able to hold on to her/his child. One child was killed when he flew from his mother's hold. Another child was rescued from an overhead compartment by a stranger.

In July 1994 during the fatal crash of a USAir plane in Charlotte, North Carolina, another unrestrained infant was killed when her mother could not hold onto her on impact. The available seat next to the mother survived the crash intact. The National Transportation Safety Board believes that had the baby been secured in the seat, she would have been alive today. In fact, in a FAA study on accident survivability, the agency found that of the last nine infant deaths, five could have survived had they been in child restraint devices.

Turbulence creates very serious problems for unrestrained infants. In four separate incidences during the month of June, passengers and flight attendants were injured when their flights hit sudden and violent turbulence. In one of these, a flight attendant reported that a baby seated on a passenger's lap went flying through the air during turbulence and was caught by another passenger. This measure is endorsed by the National Transportation Safety Board and the Aviation Consumer Action Project.

We must protect those unable to protect themselves. Just as we require seat belts, motorcycle helmets, and car seats, we must mandate restraint devices that protect our youngest citizens. I urge my colleagues to support this legislation that ensures our kids remain passengers and not victims.

###

For more information contact Rex Carney or Rebekka Bonner at (202) 224-0229.

111 Russell Senate Office Building • Washington, D.C. 20510 • 202-224-2621

Internet: press_office@murray.senate.gov

World Wide Web: <http://www.senate.gov/~murray>

CRS TEST - OUTLINE

FAA needs currently, i.e. what they tell people who ask) -

- children < 20 lbs certified, rear-facing CRS
- 20-40 lbs " fwd-facing
- " > 40 lbs lap belt

= they think even currently available = safer, tho-
not pft. (★" testing p. 5)

Current research: 1.) new restraints, better ~~restraints~~ ways
to secure conventional CRS to aircraft seat.

2.) dev. prototype "platform" for
in-seat install of fwd-facing
CRS which sig ↑ F/x stresses
(ongoing research)

3.) airplane-spec. CRS projects -
one in US, one in Canada -
both tested @ CAMI in
both fwd / aft much better
than currently available ones.

Av Transport Assoc. May '95
w/drew grt for mandating
CRS til FAA decides
want narrow, light, easy-to-
handle seat.

CAMI study -

- 1.) fwd-facing have to install -
fixed armrests, lap belts & work

* Better than lap, tho - ϕ as good as
CRS in car.

- 2.) Aft-facing "def safety benefit".

"on p. 22 last column

BUT $\rightarrow$ a.) ϕ passage b/t rows

b.) ϕ recline of fwd row seat

* HR 1141 def
b/c re-regulating
forces so can't
change $\rightarrow$ lowest
price.

Yet HR 754 primarily
reg. vehicle.

OTHER RESEARCH:

- 1.) Soc of Automotive Engineers
(SAE) ad hoc
group dev. std ^{of} aircraft
b/t seats for cars
aircraft

incidentally car crash more

severe - big problem is
aircraft belts ~~data~~
car belts

TURBULENCE happens.

FACTS ABOUT TURBULENCE

Turbulence is air movement that normally cannot be seen and often occurs unexpectedly. It can be created by a number of different conditions, including atmospheric pressures, jet streams, mountain waves, cold or warm fronts, or thunderstorms. Turbulence can occur when the sky appears to be clear.

Current Federal Aviation Administration (FAA) Regulations require passengers to be seated with their seat belts properly fastened:

- when the aircraft leaves the gate and until it climbs after takeoff;
- during landing until the aircraft reaches the gate and comes to a complete stop; and
- whenever the seat belt sign is illuminated during flight.

In the aftermath of two serious turbulence events in June 1995, the FAA issued a public advisory to airlines urging the use of seat belts at all times when passengers are seated. The FAA concluded that the rules concerning seat belts did not require strengthening but that a public education initiative was necessary to encourage the use of seat belts.

Statistics:

- In non-fatal accidents, in-flight turbulence is the leading cause of injuries to airline passengers and flight attendants.
- Each year, approximately 58 airline passengers in the United States are injured by turbulence while not wearing their seat belts.
- On December 5, 1996, an American Airlines jetliner ran into clear-air turbulence over Colorado. Sixteen people suffered injuries, including a 7-month-old baby.
- From 1981 to November 1996, there were 252 reports of turbulence affecting major air carriers. As a result, two passengers died, 63 suffered serious injuries and 863 received minor injuries.
- Both of the fatalities in these incidents involved passengers who were not wearing their seat belts while the seat belt sign was illuminated.
- Of the 63 passengers who were seriously injured, 61 were not wearing their seat belts and 59 were not wearing their seat belts while the seat belt sign was illuminated.
- Two-thirds of turbulence-related accidents* occur at or above 30,000 feet.

###

** The National Transportation Safety Board defines an accident as an occurrence associated with the operation of an aircraft in which any person suffers death or serious injury or in which the aircraft receives substantial damage.*



U.S. Department
of Transportation
**Federal Aviation
Administration**

Federal Aviation Administration
Office of Public Affairs
800 Independence Ave., S.W.
Washington, D.C. 20591

COSPONSORS OF H.R. 754
Requiring Child Safety Restraints on Aircraft
56 (updated 7/9/97)

Peter DeFazio (D-OR)
Christopher Shays (R-CT)

Neil Abercrombie (D-HI)
Gary Ackerman (D-NY)
Rod Blagojevich (D-IL)
Earl Blumenauer (D-OR)
Robert Borski (D-PA)
Tom Campbell (R-CA)
Julia Carson (D-IN)
Eva Clayton (D-NC)
James Clyburn (D-SC)
Bob Clement (D-TN)
John Conyers (D-MI)
Diana DeGette (D-CO)
William Delahunt (D-MA)
Lincoln Diaz-Balart (R-FL)
Eliot Engel (D-NY)
Lane Evans (D-IL)
Bob Filner (D-CA)
Floyd Flake (D-NY)
Martin Frost (D-TX)
Henry Gonzales (D-TX)
Luis Gutierrez (D-IL)
Maurice Hinchey (D-NY)
Tim Holden (D-PA)
Stephen Horn (R-CA)
Shelia Jackson-Lee (D-TX)
William Jefferson (D-LA)
Ron Klink (D-PA)
Tom Lantos (D-CA)
Zoe Lofgren (D-CA)
William Lipinski (D-IL)
Carolyn Maloney (D-NY)
James Maloney (D-CT)
Matthew Martinez (D-CA)
Frank Mascara (D-PA)
Mike McIntyre (D-NC)
Michael McNulty (D-NY)
Carrie Meek (D-FL)
Connie Morella (R-MD)
Jerrold Nadler (D-NY)
Eleanor Holmes Norton (D-DC)

Nancy Pelosi (D-CA)
Nick Rahall (D-WV)
Carlos Romero-Barcelo (D-PR)
Bernie Sanders (I-VT)
David Skaggs (D-CO)
Dan Schaefer (R-CO)
Vic Snyder (D-AR)
Ellen Tauscher (D-CA)
John Tierney (D-MA)
Esteban Torres (D-CA)
James Traficant (D-OH)
Bruce Vento (D-MN)
Robert Wise (D-WV)
Lynn Woolsey (D-CA)



ASSOCIATION OF FLIGHT ATTENDANTS AFL-CIO
1625 Massachusetts Avenue, NW, Washington, DC 20036-2212
PHONE 202•328•5400 FAX 202•328•5424

July 8, 1997

RECEIVED

JUL 07 1997

Dear Representative:

WASHINGTON DC 205

On behalf of the Association of Flight Attendants, AFL-CIO, representing 41,000 flight attendants at 27 carriers, I am writing to urge your support and cosponsorship of H.R. 754, legislation which requires the use of child safety restraint systems for children under two on commercial aircraft.

Last week, American Airlines and most of the major U.S. carriers announced 50 percent fare discounts for children under two who occupy approved child safety seats. During AFA's fight to mandate the use of child restraint seats, we have maintained that the airlines would offer incentives for parents who purchase seats for infants and young children. We are pleased to see the carriers made it affordable for families to protect their youngest children with child restraint seats.

Current Federal Aviation Regulations allow adults to hold an infant under the age of two on their lap during air travel. AFA, along with the National Transportation Safety Board (NTSB) and other consumers' safety groups, believes that the lap of an adult does not offer safety in the event of severe turbulence or an accident. A child on a parent's lap may break free from the adult's arms in such instances. For us, this is a crucial safety issue. Since 1989, when a lap child lost his life during the Sioux City crash because his mother was unable to hold onto him, AFA has fought to protect our youngest travelers. Representatives Peter DeFazio and Christopher Shays' legislation would assure that all passengers are protected.

The airlines' announcement of special fare reductions confirms that there is only one safe way to fly for children under two. AFA believes it is time to mandate the use of child restraint seats for our youngest travelers and provide these children the same protection as all other passengers. Now that the airlines have eased the financial burden on families who fly, it is time to pass Representatives DeFazio and Shays' bill. It is illogical that we continue to allow our most-vulnerable passengers to be held on a lap while regulations exist to restrain coffee pots and styrofoam cups.

AFA urges you to support and cosponsor H.R. 754. If you have any questions, please do not hesitate to call me or our Director of Government Affairs, Jo Ellen Deutsch.

Sincerely,

Patricia A. Friend
International President

INFLIGHT SAFETY PROFESSIONALS

Travel

WORLDWIDE
PAGE 3

FEARLESS TRAVELER

Are Babies Safe In the Air?

By James T. Yenckel
Washington Post Staff Writer

"As a flight attendant, I am responsible for passengers' safety," says Jan Brown-Lohr. "And each parents holding children on their laps, I shudder."

Lohr, a flight attendant on United Airlines Flight 232 when it made a crash landing in Sioux City, Iowa, on July 19, 1989. As the plane descended, she told parents holding babies to put them on the floor, which she said was the prescribed procedure for protecting infants in an emergency. But his did prove safe enough for one 22-month-old boy, who died in the accident.

"I saw his mother immediately after we crashed in the cornfield as she was heading to the plane to find her son. She was hurt, but I had told her to place the child on the floor and hold him. She had that, and now he was gone. I have had to live with those words...."

Lohr is a member of the Association of Flight Attendants, which earlier renewed its efforts in support of legislation requiring the use of child safety seats on flights for all children under the age of 2. Currently, a parent flying on a U.S. carrier may hold a child under 2, but the child flies free. An estimated 10,000 so-called "lap children" fly

without the use of mandatory child seats vs. free flights for lap children is a heated one in which parents are directly involved.

Although child seats are not perfect, they are considered safer for a child in an accident or strong turbulence than being held by a parent. Accident investigators have shown that the child sometimes is ripped from the parent's arms, resulting in serious injury or death. But to use a child seat, parents usually must buy an adult-priced ticket for the child or gamble that the child will be in an empty seat in which the child seat can be placed.

Parents pay for an extra ticket to assure that there is space for a child seat? It could add hundreds of dollars to their trip cost. Or do they save money by holding the child and risk the chance of an accident or injury-causing turbulence? It's a tough decision, and right now it's one that parents must decide for themselves.

The position of the Association of Flight Attendants, which represents 100,000 flight attendants on 24 airlines, is that the federal government should require the use of child seats because "far too many unrestrained children have been killed during



An aft-facing child safety seat that can be attached to the airplane floor at a parent's feet has been designed by airline pilot Thomas Bennington.

crashes or injured during turbulence." Their position is backed by the National Transportation Safety Board, which investigates airline accidents, and the Air Transport Association, which represents the major U.S. carriers.

Opposing mandatory child seats is the Federal Aviation Administration, which argues that parents unwilling or unable to pay for a ticket for their infant or toddler would drive to their destination instead, and driving is more dangerous than flying. To induce parents to use safety seats, the FAA thinks the airlines ought to reduce the cost of an infant or toddler ticket, as Southwest Airlines has done. For flights between Baltimore and Phoenix, for example, Southwest is quoting a round-trip fare of \$319 for parents and \$238 for a child under age 2.

Rep. Jim Lightfoot (R-Iowa), who has introduced legislation requiring the use of child restraint systems on aircraft, appeared at the flight attendants' kickoff press conference in Washington. Although he acknowledges "the attitude on Capitol Hill now leans toward less, not more, legislation," he is hopeful Congress will back the proposal for the sake of child safety.

Overall, flying is very safe, but the flight attendants point out that before takeoff or landing everything aboard a plane must be properly secured—except children under the age of 2. "Even a pet in a carrier or a coffee pot is better restrained," says Brown-Lohr.

To support their argument, the flight attendants cite the deaths in the past eight years of five lap children and injuries to four others—all of whom, according to the National Transportation Safety Board, might have been unharmed if they had been sitting in a child safety seat. Patricia Friend, president of the flight attendants association, quotes a mother whose infant daughter was killed in the crash of USAir Flight 1016 at the Charlotte airport on July 2, 1994, in which 37 people died. Fifteen passengers and five crew members survived.

"Suddenly there was a jolt and my baby flew out of my hands. I tried to hold on to her, and I couldn't.... They told me I could hold her on my lap. I would have paid for her to sit in a seat." News reports said the 9-month-old child was hurled forward over three rows of seats.

Rough air alone also can be dangerous to a lap child. In 1990, the flight attendants report, "a DC-10 encountered turbulence near Puerto Rico, and the only serious injury—out of 144 passengers—was to an unrestrained infant who suffered a fractured skull."

While the issue of mandatory child seats is being debated in the federal bureaucracy, parents flying with youngsters have several options that provide varying degrees of safety for their children. This information comes from the FAA, the National Transportation Safety Board, the Air Transport Association, the Association of Flight Attendants and the airlines themselves:

- An absolute no-no in case of air turbulence or an impending crash is to strap the infant and you in the same seat belt. Safety studies indicate that a parent's weight can crush a child.

- Parents can purchase a ticket for the youngster, assuring an airline seat on which to place a child safety seat. The child seats must be labeled "This Restraint Is Certified for Use in Motor Vehicles and Aircraft." The airlines, flight attendants and safety experts agree that these safety seats are currently the best place on a plane for a small child. But there are complicating factors.

In a comprehensive crash-dummy test last year, the FAA's Civil Aeromedical Institute in Oklahoma City concluded that none of the forward-facing child seats or "carriers" it tested could be anchored in a way to prevent a child's head from hitting the floor. And, if installed in a cramped economy-class seat. These safety seats—typically the ones sold for toddlers—have been designed

for use in cars, and they don't adapt properly to an airplane seat, the study found. On the plus side, the rigid shell of these carriers provides more protection than a normal lap belt for young children.

Nevertheless, new designs are needed, as the test results indicate. Meanwhile, the FAA could provide more guidance, based on its tests, about which carriers are safer than others, says Chris Witkowski, director of air safety and health for the flight attendants association. A carrier probably should be used until the child is 3, the age at which normal lap belts provide acceptable restraint.

- Also, on the "positive" side, aft- or back-facing carriers—typically sold for infants weighing less than 20 pounds—passed the tests satisfactorily. They are "a definite safety benefit for children," the study said. It did not recommend the in-flight use of booster seats, which typically do not have a rigid back, or harness systems that strap the child into an airline seat.

- Parents can take a child under 2 on the flight without buying a ticket and tote along a safety seat in hope the plane will not be full. U.S. airlines allow carriers to be used in unoccupied seats at no extra charge. Often other passengers will switch seats to allow a parent to use a carrier in an adjacent seat. If the plane is full, the unused safety seat usually counts as a piece of carry-on luggage to be placed in an overhead bin, or it can be checked at the departure gate.

- Parents without a child seat or aboard a full plane can hold the child. In the event of heavy turbulence or an impending crash, the child should be placed on the front edge of the seat between the parent's legs, and both the parent and the child should bend forward as far as possible. This is the advice American Airlines gives its flight attendants, according to spokesman Tim Smith.

- Before booking a flight on a foreign airline, parents should check its policies regarding free tickets for infants and toddlers, use of unoccupied passenger seats and whether child safety seats are permitted. Outside the United States, these policies differ.

While the debate continues, airline pilot Thomas Bennington of Smyrna, Tenn., has come up with what may be an alternative, and he has been working with the FAA and the National Transportation Safety Board to get it approved. He has designed an aft-facing child safety seat that can be attached to the airplane floor at the parent's feet. The child would be placed in the seat at takeoff, landing or when the seat belt sign is on because of turbulence.

One of the problems with this is that it could be without buying a ticket for the child. Another benefit, as Bennington sees it, is that the airlines themselves could make the seat avail-



Watch Those Roads

A new AAA survey says 26.3 million Americans will take a driving trip of more than 100 miles next weekend—the heaviest Memorial Day traffic ever.

able so that I wouldn't have to tote a carrier aboard. He describes his invention, on which he has a patent, as compact and easy to install quickly. He figures an airline could routinely supply the plane with the seats on a ratio of one for every 50 passengers at a cost of a couple of hundred dollars each. A third benefit is that his device has been designed specifically for use in airplanes, and in fact would be considered an airplane part.

If the floor seat is adopted, it probably would have to be used only at window seats, says Bennington, to keep the aisle clear in case of evacuation. On these seats, it would be necessary to install a heavy net beneath the seat to keep under-seat objects from striking the child. He also has devised safeguards to prevent a parent from inadvertently kicking the child.

Bennington began working on the project while he was a pilot on strike against Eastern Air Lines. He currently is a pilot and manager of Capital Air of Smyrna, which flies between Miami and the Caribbean. "The ongoing problems and solutions have been many and have cost tens of thousands of dollars and taken years," he says, "but I am confident they are coming to a conclusion soon."

Until some solution is achieved—be it mandatory child safety seats (with improved design) as the flight attendants advocate, cheaper tickets for infants and toddlers as the FAA urges or the adoption of Bennington's device—it is apparent that every other passenger today is flying safer than lap children. And this, says flight attendant Jan Brown-Lohr, "is a tragic mistake."

Committee on Transportation and Infrastructure

Congress of the United States

House of Representatives

Room 2165, Rayburn House Office Building

Washington, DC 20515

TELEPHONE: AREA CODE (202) 225-9446

July 29, 1996

MEMORANDUM:

TO: Members, Aviation Subcommittee

FROM: John J. Duncan, Jr., Subcommittee Chairman

SUBJECT: **SUMMARY OF SUBJECT MATTER:** Hearing on H.R. 1309, a bill which would require the use of child safety restraint systems on any domestic or overseas flight. Hearing scheduled for 15 minutes following the Full Committee Markup Thursday, August 1, 1996, 2167 Rayburn House Office Building.

Purpose

To examine safety issues related to the use of child safety seats (CSSs) aboard aircraft. To determine the impact a mandatory CSS rule would have on safety and total fatalities.

Background

Currently, parents flying with children under 2 years old are not required to purchase an additional ticket for the child. These infants may ride on the laps of their parents without charge. Since 1985, when the FAA first permitted the use of child safety seats (CSSs) aboard air carrier flights, there have been a small number of well-publicized incidents where children who were not in CSSs were killed or injured in aviation accidents. According to a DOT-FAA report released to Congress on June 7, 1995, in the event of a crash, infants and children who are seated in a CSS are more likely than children who are seated on the laps of their parents to survive and escape serious injury.

A United Airlines crash in Sioux City, Iowa resulted in the death of one lap-held infant and minor injuries to two others. Two of these infants were separated from their parents during the crash, one was found in an overhead baggage compartment by another passenger, the other was not found and died of smoke inhalation. Incidents such as this one and general safety concerns have led some groups to endorse requiring CSSs for all children under the age of two who are flying aboard aircraft.

Child safety seats require an additional seat for their proper use. Requiring CSSs would impose additional costs on airlines, families, or both, depending upon the specific implementation of such a requirement. These additional costs may cause some families to forgo travel or to choose other modes of travel with higher accident rates, such as by automobile. Causing families to travel by automobile instead of by aircraft may lead to a net increase in lives lost. Most studies evaluating the impact of a mandatory CSS rule have concluded that if parents are required to pay for the additional seat, then it will result in a net increase in lives lost due to diversion to other modes of travel.

Mandatory CSS use may pose many logistical problems to airlines. Some families do not own a CSS, others may own ones which are damaged or inadequate for air travel. Airlines may have to provide CSSs to these families or they may be forced to turn them away. Carriers would have to purchase CSSs and keep them stocked where they are needed. There would be difficulties in keeping CSSs stocked since in most cases, they will be left at the passengers' destination, not at their origination points. CSSs would need to be shipped to where demand for them is greatest. Ensuring that all these steps are properly implemented would impose logistical and financial burdens on airlines some of which may be passed on to airline passengers.

In addition, there have been questions about the effectiveness of CSSs. Though most CSSs are approved for use in both automobiles and aircraft, they are specifically designed and tested for use in cars. The FAA Civil Aeromedical Institute (CAMI) conducted a study in which many CSSs were not as effective in an aircraft environment. A child in a CSS is still safer than a child in a parent's lap, but requiring a CSS may imply a higher level of safety than is actually the case.

Summary of Studies

Most studies of the possible impacts of a mandatory CSS rule focus on the costs imposed on families and the traveling public and the effects of passenger diversion on the number of fatalities. These studies are based on estimates of the price elasticities of demand for air travel. The price elasticity of demand is a measure of the sensitivity of demand to changes in price. The demand for air travel is considered elastic because when the price of a ticket increases, fewer people buy tickets. But when the ticket price decreases, ticket sales rise.

The FAA contracted with Apogee Research to conduct two studies on the effects of a mandatory CSS rule. The first study, conducted in 1990 concluded that the average increase in trip cost was \$185 for families who would have to purchase a seat for their infants. A mandatory CSS rule would cost families \$252 million annually in additional air fare. Approximately 17 percent of families would choose to forgo travel or divert to other modes, leading to a net increase of 1.6 fatalities, 4.8 serious injuries, and 218 minor injuries in the first year of implementation. This study assumed that infants made up 1 percent of commercial enplanements and that infants were charged the same price as children between the ages of 2 and 12, two-thirds of adult fares.

The second FAA study, conducted in 1993, again concluded that total fatalities and injuries would increase and costs to the traveling public would be increased, but these effects could be mitigated by discounts from air carriers. This study also determined that as an alternative to mandatory CSS use, if airlines did not sell seats adjacent to parents or guardians until the plane was full, 95 percent of the safety gains would be realized at very low system costs, i.e., the cost to reprogram reservation systems.

A study conducted in 1990 by Windle and Dresner of the University of Maryland came to conclusions that were broadly similar to the ones reached by Apogee Research in its first study. In 1990, the Cato Institute published a study by McKenzie and Lee as a briefing paper, again coming to similar conclusions. This study assumed that if one third of families were not willing to pay higher fares and drove instead, an additional 185 million miles would be driven each year leading to an additional 175 disabling injuries and 5 highway fatalities each year.

On May 3, 1995, the Association of Flight Attendants released research conducted by Darryl Jenkins, an aviation economist, reexamining the economic arguments against a mandatory CSS rule. Jenkins states that a single demand curve oversimplifies the industry, which should be segmented. Previous studies did not take into account the entry of low-cost carriers which serve different markets and compete with automobile travel, not other air carriers. Jenkins believes travelers diverted from regular carriers could be diverted to the low-cost carriers, not to automobile travel. He did not address the issue of whether those who used low-cost carriers would be diverted to automobile traffic. He concluded that the passenger diversion argument was an invalid argument against requiring CSSs in flight.

On June 7, 1995, the DOT-FAA released a study, titled "Child Restraint Systems" to Congress. This study was mandated by Section 522 of the Federal Aviation Administration Act of 1994, P.L. 103-305. It addressed many of the concerns of the AFA study, but reached conclusions similar to those of Apogee Research. Seven different scenarios of a mandatory CSS rule were modeled, varying who would provide the CSS and the fare which would be charged to an infant. Passengers were broken down into several different categories, the main concern which Jenkins stated in his study. They were broken down into business and non-business travelers, short and long distance flights, and low and high income travelers. Elasticities were then estimated for these groupings based on relevant past studies of airline price elasticities. When the increase in price was large, traveling families were less likely to travel by air.

The report concluded that a mandatory CSS rule could save up to 4.9 infant fatalities over 10 years, but passengers who chose to drive because of increased fares could cause a net increase in fatalities because of the higher fatality and injury rate associated with driving. Only when an airline charges infants 20 percent of the full fare does the number of infant fatalities prevented in air travel equal the number of additional infant fatalities caused by diversion to automobile travel, but at this level there are 12.8 additional non-infant fatalities over ten years.

In all circumstances, airlines will lose money. Passenger diversion could mean a loss to airlines of \$520 million annually or \$3.6 billion over ten years. Under the best scenario for carriers in which they charge no fare for infants, the net present value of incurred loss would be \$28.4 million over ten years.

In September 1994, the FAA Civil Aeromedical Institute (CAMI) conducted a study and found that many child safety seats approved for use on airlines do not provide the full measure of protection they imply. Safety seats are tested for use in cars and presumed to be safe for use in planes. However, there are significant differences between car and airplane seats. The belts are at different positions, the buckles are different, airplane seatbelts do not automatically adjust their length as car seats do, some seats do not have armrests which stow away, and the row of seats are closer together. All these factors often do not allow the proper installation and use of a CSS in airplanes, with negative impacts on CSS effectiveness. While rear-facing seats for small infants are effective, forward-facing ones are not. Vest and harness systems, booster seats, and belly belts were determined to be ineffective in aircraft and more dangerous than if no system were used. As a result, their use was subsequently banned from flights during take-off, landing, or movement on the surface. Despite its problems, use of a forward facing CSS was determined to be safer than placing a child on a lap.

Regulations

14 CFR Part 121, Section 311. This section states that:

- A child may be held on the lap of an adult provided that the child is under the age of two and is not using any restraining device. (Paragraph (b)(1))
- A child may use a FAA-approved CSS as long as it bears a label stating that it conforms to all applicable Federal motor vehicle standards if it was manufactured after January 1, 1981. Those manufactured on or after February 26, 1985 must bear an additional label stating that the device is certified for use in motor vehicles and aircraft. However, no booster-type, vest and harness-type, or lap-held CSS is approved for use aboard an aircraft and may not be used during takeoff, landing, or movement on the surface, regardless of any labels they may bear. (Paragraphs (b)(2)(ii)(A),(B),(D) and Paragraph (c)(1))
- No carrier may prevent a child from using an appropriate CSS if that child holds a ticket for a seat on the plane or if such a seat is made available to that child. (Paragraph (c)(2))

Legislative Efforts

On July 12, 1990, the Aviation Subcommittee held a hearing to determine whether the FAA should require CSS aboard aircraft for children under two. At the time, mandatory CSS legislation, H.R. 4025, had been introduced by Congressman Jim Lightfoot. No action was taken on this legislation.

On October 7, 1993, Congressman Lightfoot offered a mandatory CSS amendment during floor consideration of H.R. 2739, a bill reauthorizing the FAA and associated programs. Congressman James Oberstar then offered an amendment as a substitute to Mr. Lightfoot's amendment. This amendment would have required air carriers to provide CSSs to children for all flights. This amendment was approved by a vote of 270 to 155. However, the conference committee decided to adopt the Senate provision on child safety seats. This provision mandated a Department of Transportation study on the safety and efficacy of CSSs and the impact a mandatory CSS requirement would have on families, passenger volume, and infant fatalities over a ten year period. This report, titled "Child Restraint Systems", was submitted to Congress on June 7, 1995 and is described above.

On March 23, 1995 Congressman Lightfoot introduced a bill, H.R. 1309, which would mandate CSS use by children flying on aircraft.

FAA's Position

Since 1985, the FAA has allowed safety seats to be used but does not require them. Airlines are required to allow the use of FAA approved safety seats if a passenger has purchased a ticket for an infant or if a vacant seat is made available at the time of departure. That is, if a child can use a seat, that child may use a CSS in that seat.

The FAA strongly recommends that all children who fly, regardless of age, use an approved CSS appropriate for their size and weight. Based on the result of CAMI tests, the FAA recommends rear-facing safety seats for children under 20 pounds, forward facing safety seats for children between 20 and 40 pounds, and standard aircraft lap belts for children over 40 pounds. Despite the problems of forward facing seats, they represent the best and safest alternative available for children weighing between 20 and 40 pounds.

Though the FAA supports and recommends the use of CSSs, it does not believe that their use should be made mandatory. This position is based on the studies which state that a mandatory CSS rule would lead to a net increase in lives lost due to diversion of passengers to automobile traffic, a more dangerous mode of travel. Given this, the FAA believes that efforts to inform and educate passengers about the benefits of CSSs would be more effective in saving lives than a mandatory CSS rule.

NTSB's Position

The National Transportation Safety Board (NTSB) disagrees with FAA's conclusion that a mandatory CSS rule would lead to more deaths due to the diversion of travel to other modes of transportation. The NTSB believes there should be a single standard of safety for all passengers and that allowing infants to travel on the laps of their parents is not consistent with such a standard. On May 22, 1990, the NTSB approved by a 4-0 vote a recommendation to:

Revise CFR 91, 121, and 135 to require that all occupants be restrained during takeoff, landing, and turbulent conditions, and that all infants and children below the weight of 40 pounds and height of 40 inches be restrained in an approved child restraint device appropriate to their height and weight.

NTSB's position did not change when FAA released its report to Congress on June 7, 1995. In a letter to Administrator Hinson, Chairman Jim Hall of NTSB stated that airlines would lose revenue if a substantial fare for infants were charged and would prevent this revenue loss with appropriate pricing policies. NTSB believes that a mandatory CSS rule would save lives, not cause more lives to be lost due to diversion to automobile traffic.

Flight Attendants' Position

The Association of Flight Attendants (AFA) believes that child safety seats should be mandatory for children under two years of age. They believe that it is inconsistent with safety to allow children under two to fly unsecured when all other passengers and all other items must be secured for flight. The AFA believes that many incidents in which infants without CSSs had died or were injured could have been prevented with a mandatory CSS rule and that future deaths and injuries could be avoided by passing a CSS law.

Airlines' Position

Airlines are currently free to impose mandatory CSS policies, but do not do so because they fear that any airline which did would be placed at a competitive disadvantage. The Air Transport Association (ATA) has historically endorsed a mandatory CSS requirement, provided that passengers and not airlines were required to provide the CSSs. In 1993, NTSB, the ATA, Aviation Consumer Action Project, Aerospace Medical Association, Airline Pilots Association, and AFA supported Congressman Lightfoot's mandatory CSS amendment to H.R. 2739.

In May 1995, after the CAMI report on CSS effectiveness was released, the ATA withdrew its support for a mandatory CSS requirement until the FAA first determines the best way to protect children. Airlines do not want to be held liable for endorsing child safety seats later found to be inadequate. They have asked the FAA to develop a seat which is lighter and easier to handle. A narrower seat could be more easily slid into compact airline seats and some CSSs are so bulky that they block aisles.

Since the ATA withdrew its support for such a policy, it has taken no position on any mandatory CSS legislation, including H.R. 1309. The ATA does believe that the FAA should determine and implement, as quickly as possible, standards for CSSs which would ensure the maximum degree of safety for children flying aboard aircraft.

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The Performance of Child Restraint Devices in Transport Airplane Passenger Seats

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THE PERFORMANCE OF CHILD RESTRAINT DEVICES IN TRANSPORT AIRPLANE PASSENGER SEATS

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ABSTRACT:

The performance of child restraint devices (CRDS) in commercial transport airplane passenger seats was evaluated by a dynamic impact test program. Background information on the policies and regulations related to child restraints is summarized. Tests were conducted at the FAA Civil Aeromedical Institute. Six types (CRDS) certified for use in airplanes were tested. Booster seats, forward facing carriers, aft

facing carriers, a harness device, a belly belt, and passenger seat lap belts were evaluated. Impact tests were conducted with CRDs installed on airplane passenger seats. The test severity was 16 Gpk with an impact velocity of 44 ft/sec. Effects of multiple row seats, aft row occupant impact loads, and seat back breakover were part of the project protocol. Four child size anthropomorphic test dummies were utilized. The 6-month and 36-month size ATDs defined in 49 CFR Part 572, the 6-month size CRABI ATD, and a 24-month size experimental ATD identified as CAMIX were used in these tests. An experimental device to measure abdominal pressure was evaluated in the CRABI and CAMIX ATDS. Analyses of the data acquired from the tests and observations related to the performance of the CRDs in airplane seats are presented.

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The Performance of Child Restraint Devices in Transport Airplane Passenger Seats

PART I Issues, Policies, and Standards

Performance standards for child restraint systems sold in the United States are defined by Federal Motor Vehicle Safety Standard 213 (FMVSS-213)(1*). There are important differences between airplane and automobile seats. The methods and fixtures used to certify child restraints may not produce results that effectively measure their performance in an airplane seat. With the advent of dynamic seat performance standards for modern airplane seats, it is important to determine the performance of child restraints in a representative test condition for the airplane environment. As a minimum, the performance criteria of child restraints installed in airplane seats should provide the level of protection implied in the government standards and test procedures by which they are approved. These criteria include protection from serious injury to the head, chest, and legs. Public awareness of the benefits provided by child restraints has grown during the past decade. The use of child restraints in automobiles has increased with the passage of laws by all 50 states requiring approved restraints for young children. The availability and variety of designs have increased as well. More than 45 models of approved child restraint systems are now produced. The National Highway Traffic Safety Administration (NHTSA) estimates 4.5 million child restraints are sold yearly. Both the increased awareness and use of approved child restraints by the public may escalate the use of child restraints in commercial air transport. Thus, it is important that the standards governing the performance of child restraints result in products that meet the expectations of the users in both automobiles and airplanes. The term "child restraint system" in FMVSS213 applies to portable as well as built-in restraints. Indeed, occupant protection must be addressed from a systems approach which includes the vehicle seat, restraints, and surrounding structures. When a portable child restraint is installed on an airplane passenger seat, the child restraint becomes a component in the passenger seat system. An

effective assessment of the system performance should include the key components of the system. For the purposes of this report, the term child restraint device (CRD) will be used to distinguish between the portable child restraint and the overall passenger seat system.

AVIATION REGULATORY POLICIES

In 1982, the FAA's first policy that allowed the use of CRDs in airplanes was issued in Technical Standard Order (TSO) C100. Prior to the issuance of this order, the use of passenger furnished child restraints was not allowed during takeoff or landing. Voluntary performance standards for child restraints in airplanes had been developed by industry (2,3). However, the FAA's policy, based on FAR 121.311, stated child restraints brought on board an airplane must be treated as carry on baggage. TSO C100 defined two performance standards for CRDs in airplanes. The first was FMVSS-213 as amended in 1980. The second performance standard was defined in the TSO. An 18 G, 22 ft/sec dynamic test with the CRD installed on a "representative" airplane seat fixture was specified in the TSO. A list of TSO approved CRDs was provided by the FAA.

*Numbers in parentheses indicate references at the end of the report.

At the recommendation of a United States Department of Transportation (DOT) report issued in 1983 (4), TSO C100 was amended in 1985. The dynamic test procedure was deleted from the TSO. FMVSS-213 was also amended to include a roll over test for CRDs in airplane seats, and this NHTSA standard was designated by the DOT as the solitary standard for child restraints. "Approved child restraints" for air carrier operations in the United States were devices certified to meet the requirements of FMVSS-213. A CRD labeled as meeting FMVSS-213 could be allowed, at the discretion of the operator of the airline, as a child restraint. Changes to the FAR in 1992 (5) expanded the definition of approved child restraints to include any CRD that is labeled to meet United Nations or foreign government standards. The 1992 amendments explicitly removed the discretionary allowance of approved CRDs by the operator. Thus, if any approved CRD is furnished for a child holding a ticket, it must be allowed by the operator. Simultaneously in 1992, the FAA amended Advisory Circular (AC) 91-62 which defined certain types of CRDs approved per FMVSS-213 that should not be used in airplanes. A CRD that positions the child on the lap or chest of an adult seated in a passenger seat should not be used according to the AC. This is despite the fact a CRD of this type may be labeled to meet the requirements of a recognized international standard or foreign regulatory authority. Other limitations for CRDs, such as seat location and proximity to an accompanying adult, were also contained in this Advisory Circular. Additional policy information was published by the FAA in the form of a Flight Standards Information Bulletin (FSIB Number 92-23) concurrent with the amended FAR and Advisory Circular. This FSIB contained the same information as issued in AC 91-62.

AIRCRAFT SEAT REGULATIONS.

A separate activity by the FAA in the 1980s resulted in improved performance criteria for aircraft passenger and crew seats (6). Regulations adopted in 1988 defined measurable performance standards for assessing occupant protection from crash injuries as well as structural performance of the seat and restraint system. Dynamic impact test conditions and the pass-fail criteria are specified in the FAR. Two test conditions are specified, a horizontal and a vertical impact orientation. The responses recorded from anthropomorphic test dummies (ATDS) occupying the seats during the tests must indicate protection from serious injuries to the head, lower spine, femurs, and chest. Occupant injury due to contact with structures and furnishings surrounding the seat installation must be considered in the certification procedures for the seat. Thus, impact tests for certification of airplane seats often include a representative environment of the seat installation. Performance is measured as a system, rather than an evaluation of the

components by separate tests. The FAR also specify a 50th percentile ATD as the occupant for measuring impact responses. The lap belt restraints on seats certified by the FAR must accommodate a range of occupant size from a 2-year old child to a 99th percentile male. There is no requirement for seats to accommodate CRDS, nor is there an FAA requirement to assess injury protection for occupants in CRDs installed in passenger seats. Thus, new airplane seat performance regulations focus on adult occupant injury protection. Providing additional protection by means of a CRD is the option of the accompanying adult.

CHILD RESTRAINTS IN AIRPLANE SEATS - PREVIOUS RESEARCH

Previous reports on the performance of child restraints in airplane seats have differing results. Most studies have applied the test conditions of existing or proposed automotive standards for CRDs at the time of the studies. Chandler and Trout (7) in 1978 identified difficulties with adapting restraint devices to an airplane seat. They also noted potential hazards due to seat back breakover contact forces on the occupant of a CRD. In 1983 Naab at Calspan (8) tested 98 CRDs installed on an airplane seat fixture. Based on FMVSS-213 requirements existing in 1983, Naab reported all were successful in meeting the pass/fail criteria. It is important to note that most of the 1983 Calspan tests were conducted at 20 miles-per-hour (22 ft/sec), which is half the impact velocity currently specified in the current FMVSS-213. Also, the vehicle peak acceleration for most of the Calspan tests was approximately 17 G's, whereas, the current FMVSS-213 requirement is a minimum of 24 G's. A 1993 report (9) by Hardy at the Cranfield Institute in England documented tests with CRDs available in the United Kingdom. Impact tests were performed with CRDs restrained on an airplane seat. Forward facing CRDs were tested at an impact severity of 22 Gpk, and aft facing devices were tested at 16 Gpk. The Cranfield report noted few, if any, of the automotive child restraints built to meet automobile standards would pass the requirements in an airplane seat. Hardy concluded that some of the CRDs tested in the Cranfield study would perform satisfactorily at a reduced impact severity. He also noted the survivable crash condition associated with transport airplane seats is less severe than automobile standards applied for CRDS. The Cranfield study also included lap held children with and without supplementary restraints attached to the adult's lap belt. The implications drawn from these tests and noted by Hardy are significant. First, placing unrestrained children on the lap of an adult is "...likely to promote fatalities and injuries to these children in an impact situation." Second, supplementary restraints for lap held children "...may promote other injuries due to the manner in which the restraining forces will be transmitted to the children."

CHILD RESTRAINTS - CURRENT PERFORMANCE STANDARDS

The approval method in FMVSS-213 strictly specifies the test fixtures, procedures, impact conditions, and pass-fail criteria. For portable child restraints, there is no allowance to address the performance of the CRD in a vehicle environment other than the defined test method. The fixtures used to certify CRDs are not representative of the installation of a CRD in an airplane passenger seat. FMVSS-213 test fixtures are designed to represent an automobile seat with the lap belts and shoulder strap anchored geometrically at locations typical in automobiles. There is no allowance to include structures which represent the vehicle's interior environment in front of the CRD, such as a dash panel or front seat.

Significant differences exist between the test fixture specified in FMVSS-213 and the typical transport airplane passenger seat. Figure 1.1 illustrates some of these differences. These dissimilarities can affect the overall performance of a CRD when dynamically tested. Some of the most notable differences are:

1. Lap belts on the FMVSS-213 fixture are attached at locations that are geometrically different from a typical airplane passenger seat. The inboard and outboard belt anchor points on the automotive test fixture are at different heights. A line passing through the belt anchor points is not parallel to the lateral

line defined by the seat back pivot axis. The lap belts on an airplane seat are usually located near a horizontal lateral line passing through the cushion reference point (CRP). This difference results in a more vertical lap belt path over the CRD in the airplane seat.

2. The seat back on the FMVSS-213 test fixture does not rotate forward in a manner representative of airplane passenger seats during the impact. It is common for passenger seats to have breakover seat backs as a convenience feature. On seats with breakover backs, the seat back can be rotated forward to a horizontal position by pushing on the seat back, nominally with 30 pounds of force applied at the top of the back. (Regulations prohibit the installation of seats with breakover backs at certain locations in the cabin). The combined effects of breakover seat backs and aft row occupant impact forces transferred through the seat back are not evaluated by FMVSS-213.

3. A specific restraint system is not prescribed by FMVSS-213. Modern automobile restraints use a short fixed-length strap on one side. The tension of the belts and shoulder straps is automatically adjusted by the retractor mechanism in the inertia reel. Typically, an automobile buckle is positioned to the inboard side of the occupant when in use. Airplane passenger seat belts are manually adjusted, and the range of adjustment is limited. The buckle on an airplane passenger seat is centered over the lower abdomen when adjusted by an adult occupant.

4. The buckle release mechanisms differ. Modern automobile buckles are smaller and have a push button release. Airplane buckles are usually as wide as the two inch webbing of the belts and have a lift-latch type release. Space above the buckle is required to lift the release plate when removing the belts.

5. The available lateral space for the installation of a CRD on airplane seats is limited to the distance between the arm rests. Typically, this distance is 16.5 to 17.5 inches on economy class seats. On most economy class seats the arm rests can be raised to a stowed position which provides additional space. However, seats in some rows have non-stowable arm rests which may prohibit some CRDs' installation. The FMVSS-213 fixture has no arm rests and provides a wide unobstructed cushion for CRD installation.

Foreign standards for child restraints differ from FMVSS-213. Canada and Australia require a tether strap to secure the CRD to a fixed point on the vehicle. The requirement for a tether strap will prohibit the installation of these devices on transport passenger seats unless the device has been approved for airplane use without the tether by the responsible authorities. Test fixtures and impact severity are also different among the foreign standards. However, foreign approval methods rely on automobile test procedures as the means of measuring performance. Thus, the effects of differences between automobile and airplane seats apply to foreign approved CRDs as well those approved in the US.

COMPARISON: FMVSS-213 AND FAR 25.562.

There are similarities between the pass-fail criteria in FMVSS-213 and FAR 25.562. Both have requirements for structural integrity. Head injury protection, measured by the Head Injury Criteria (HIC), is specified in both regulations. The HIC is determined from a numerical computation performed on head acceleration data. If the value resulting from the HIC computation exceeds 1000, which is considered as an indication of the onset of serious injury, the criteria in the regulations is not met. The HIC is applied only in cases of head contact with surrounding structures in the FAR. Certification of airplane seats often includes representative structures and furnishings in the proximity of the seat installation. HIC is also computed from the FMVSS-213 test procedure. However, there is no structure placed in front of the CRD in the automotive standard. The only potential head strike structures are the CRD and the padded

seat fixture. A maximum head forward excursion limit of 32 inches from the seat back pivot axis is specified in FMVSS-213. This forward excursion distance is representative of the clearance for a CRD installed on the front passenger seat in an automobile (10). The impact severity for the horizontal test condition in FAR 25.562 is significantly less than the required test in FMVSS-213. Shown in Figure 1.2, the peak deceleration in FMVSS-213 is a minimum of 24 G's. The minimum peak acceleration in FAR 25.562 is 16 G's. The FAR requires a second test condition that is a vertical impact orientation. For transport category aircraft, the vertical impact severity is less than the horizontal test severity. Its main purpose is to insure occupant spinal loads do not exceed a specified criterion of 1500 pounds. Another important difference exists in the pass-fail criteria of the two regulations. Any evidence that the lower torso restraints load the abdominal region above the pelvis are cause for rejection by the FAR. FMVSS-213 does not prohibit abdominal loading. In fact, the primary load path for some CRDs is directly into the upper abdominal region.

Part II

Child Restraints - Research Project

A project was initiated by the FAA Civil Aeromedical Institute (CAMI) Biodynamics Research Section to evaluate approved CRDs currently used in commercial air transport operations. There were no specific "pass/fail" criteria for the CRDs tested by the conditions of this project. Rather, the objective was to evaluate performance factors such as installation difficulties, physical interface with the airplane seat, retention of occupant, and analysis of injury potential by biomechanical responses from the ATDS. Representation of the physical environment surrounding the seat-restraint installation in a transport airplane was included in the test protocol.

PERFORMANCE FACTORS

The three performance factors examined by dynamic impact sled tests with CRDs were as follows:

Factor 1: Fit and adjustment. The physical interface between the CRD and a passenger seat was addressed by this factor. This factor included an assessment of lap belt interface and proper adjustment of the CRD installed in a passenger seat. Ergonomic considerations as well as observations concerning potential misuse or incorrect installation were also considered.

Factor 2: Dynamic performance. This factor was based on an evaluation of observations and measurements from impact tests with the CRD installed in an airplane passenger seat. The dynamic test condition was the 16 Gpk, 44 ft/sec impact pulse as defined in FAR 25.562. The evaluation included dynamic displacement, interaction with breakover seat backs, and compatibility with the lap belts. Occupant head excursion was included in this factor.

Factor 3: Occupant protection. Occupant protection was assessed from biomechanical responses acquired from the child ATDS. Included were head and chest accelerations required for approval as defined by FMVSS-213. The pass/fail criterion in the automotive regulation require that the resultant chest acceleration not exceed 60 G's for over three milliseconds. Potential head injury was assessed by the HIC. Head acceleration data were acquired only in tests where head contact on structures occurred. An experimental method to measure abdominal forces induced by the CRD was also evaluated.

The test conditions and devices for the series of tests in this project were not selected for the purpose of validating the CRDs' performance per the requirements of FMVSS-213. Rather, the goal of the protocol was to investigate the above factors under the impact conditions considered survivable in modern transport category airplane seats.

CRD TEST SPECIMENS

Table 2.1 lists the models of child restraints evaluated in this test program. The CRDs provided for this dynamic test project were classified into five types, and normal passenger seat lap belts were included as the sixth type of restraint system. Figure 2.1 displays the weight ranges for the types of child restraints tested in this project. The six types of CRDs are described by the following:

- 1. Booster Seats.** Booster seats are designed for children who weigh in the range of 30 to 60 pounds. These seats are a raised platform base on which the child sits. A front shield, over which the lap belts are routed, covers the abdominal area of the Occupant. Booster seats do not have a back or side shell. There are no integral belts to restrain the child. Depending on the model, some booster seats can be used without the front shield if a shoulder strap is available. Four booster seats were tested in this project. All were labeled as meeting FMVSS-213 and certified for use in airplanes.
- 2. Forward Facing Convertible Carriers.** These devices are designed to be installed forward facing in the vehicle seat for children weighing more than 20 pounds. For children who weigh less than 20 pounds, the convertible carrier CRD is installed facing aft. Many have a maximum occupant weight restriction of 40 pounds. All convertible carriers provide shoulder straps as part of the CRD. This type of CRD has a back and side protection shell. Not all models of convertible carriers have a rigid front shield. Some have a padded "Y" plate integral to the shoulder straps on the CRD. These devices are usually installed by routing the vehicle lap belts through a path provided on the back of the forward facing CRD. Six FMVSS-213 approved convertible carriers and one U.K. approved (ECE-44) convertible carrier were tested in this project. One forward facing carrier included in this project was a CRD device designed specifically for use in an airplane passenger seat. CRD S was designed for forward facing installation. The range of occupant size for CRD S was children between the ages of 6 months and 3 years. It includes an integral 5-point restraint with a rotary release buckle. The seat back is hinged to allow the device to fold for storage in an overhead bin. This device met the European Community Standard ECE-44 standard for child restraints.
- 3. Aft Facing Carriers.** These CRDs are only for small children weighing less than 20 pounds. There is no shield over the chest or abdomen of the child. Adjustable shoulder straps are provided integral to the CRD. Typically, an aft facing carrier for small children is installed by tightening the vehicle lap belts through slots on the top side of the CRD. This type of device should not be installed forward or side facing, i.e., the CRDs are non-convertible. Five aft facing non-convertible carriers were included in these tests. All five aft facing CRDs were sold in the United States and certified for use in airplanes.
- 4. Torso Harness.** The fourth type of CRD is a torso harness designed for children weighing between 25 and 40 pounds. These are forward facing restraints fabricated with webbing. There is no rigid shell or platform with these harness devices. The CRD attaches to the vehicle's lap belts by passing the belts through a loop sewn on the back side of the harness. Harness systems are relatively new products. They have the convenience of being lightweight, compact, and easy to install. There are at least three models that currently meet the requirements of FMVSS-213 and certified for use in airplanes.
- 5. Lap Held Child Restraint.** Commonly identified as the "belly belt," this device restrains a small child (less than two years old) on the lap of an adult. Although not approved for use in automobiles by any standards, the belly-belt is certified for use in airplanes by the Civil Aviation Authority of the UK.
- 6. Passenger Seat Lap Belts.** Children of any age are allowed to be restrained by the lap belts provided on the passenger seat. Therefore, tests with normal lap belts were conducted for comparison with the

add-on devices described in types I through 5 above.

ANTHROPOMORPHIC TEST DUMMIES

Four types of child ATDs were utilized in these tests. Two are standard child ATDs as defined in 49 CFR Part 572: the three-year-old Part 572-C with instrumentation, and 6-month old noninstrumented "bean bag" Part 572-D. The third type was an articulated 6-month old identified as the "Child Restraint and Air Bag Interaction" (CRABI) dummy being developed by the Society of Automotive Engineers (SAE) Infant Dummy Task Group (11). The CRABI dummy has provisions for head and chest instrumentation. The fourth ATD was an experimental 24-month old ATD identified as CAMIX. Table 2.2 lists some of the key anthropomorphic dimensions of these ATDS. The CAMIX ATD, pictured in [Figure 2.2](#), was developed by Richard Chandler and Joe Young at CAMI for the primary purpose of measuring abdominal pressure loads induced by restraint systems during dynamic tests. The design of the ATD includes articulated limbs, a cast metal pelvis, and an abdominal cavity for fluid pressure instrumentation. The pressure measurement system was comprised of a 500 ml. water-filled intravenous fluid bag. A pressure transducer was attached to the fluid bag by means of a plastic tube. [Figure 2.3](#) shows the system installed in the CAMIX ATD. This was an experimental ATD intended to measure relative differences in abdominal loading from tests with various CRDS. The abdominal pressure instrumentation was also installed in the 6 months old CRABI ATD for selected tests. The water volume in the fluid bag was reduced to 300 ml. when installed in the CRABI ATD. Only one abdominal pressure measurement per test was possible.

There were no established injury criteria for this abdominal pressure measurement. Avoidance of loads in the soft tissues of the abdomen was considered a critical factor in restraint performance. Previous studies to measure abdominal intrusion and pressure in child restraint tests have identified this factor as an important component of restraint performance (12,13). FAR 25.562 requires that lap belt restraints must remain on adult ATD's pelvis during the impact test to certify an airplane seat. Any indication that the belts move above the prominence of the anterior iliac spine of the test dummy, thus loading the abdomen, is cause for rejection of the seat certification. A 50th percentile Hybrid 11 male, specified in 49 CFR Part 572-B, was used in tests to evaluate the lap position belly belt CRD. The 50th percentile ATD was also used to induce aft row occupant impact loads on breakover seat backs.

PASSENGER SEAT SPECIMENS

Economy class triple position transport passenger seats were obtained for this project. The seats are considered typical in construction and dimensions of passenger seats currently in service. These seats were complete assemblies with armrests, backs, tray tables, and cushions. Standard passenger seat lap belts were provided with the seats. All of the seats used in this project were the same model, with the exception of one seat having tray tables in the fixed armrests. The only modification made to the seats was a seat back breakover lockout plate which was installed on selected tests to inhibit forward rotation of the seat back. For tests with unlocked seat back breakover, the breakover mechanism was adjusted to initiate forward rotation of the seat back with a 30 pound horizontal force applied at the top of the tray table.

INSTRUMENTATION

The biomechanical responses obtained from the tests were dependent on the particular ATDs installed for each test as well as the test configuration. Head impact accelerations were recorded only when there was likelihood of head contact. Thus, head impact responses from forward row ATDs were not recorded. Chest accelerations were recorded if the ATD had provisions for chest instrumentation. Photometric cameras were positioned on both sides of the impact area to provide accurate coverage of the left and

right seating positions when multiple occupants tests were conducted. High speed video recordings were obtained from a "best view" camera perspective for qualitative analysis.

TEST FACILITY AND METHODS

This project was conducted at the CAMI Biodynamics Research Section dynamic impact laboratory. The CAMI impact sled system is a horizontal deceleration facility. Fixtures and test specimens are installed on a ten by five foot sled mounted on a 150 foot long parallel circular rail track. The sled is accelerated gently (less than 0.4 G) to the impact velocity by means of a falling weight attached through a wire rope and pulley system. A controlled deceleration pulse is produced with a wire brake mechanism. The moving sled contacts a set of 0.235 inch diameter steel wires placed across the track at the impact site. As the sled moves into the wire pattern, the wires are pulled through rollers anchored to the laboratory floor. The force required to pull the wires through the rollers decelerates the sled. Control of the impact pulse shape is determined by the number of wires, placement in the wire pattern, and the lengths of wires.

TEST SLED CONFIGURATION

Figure 2.4 shows the impact sled configuration for the horizontal tests of this project. Dimensions of the double row seat installation represented by the sled test setup are shown in Figure 2.5. Fixtures were installed on the sled to mount the seats in forward orientation. There was no yaw or pitch relative to the impact vector. The fixtures on the sled permitted single row and double row installations of the passenger seats. Double row tests were conducted with 32 inch seat pitch between the seats, which is representative of an economy class cabin. In most tests, more than one CRD was installed in the triple position passenger seats. Vertical impact tests were all single row with the floor for the seat mounted on a 60 degree pitch fixture. Figure 2.6 is a photo of the vertical test setup.

TEST VARIABLES

The primary variable of the tests was the configuration of the passenger seats. Three types of configurations were conducted: 1) single row, 3) double row, and 3) vertical orientation. These configurations are defined as follows:

Single Row Tests. Single row test configurations were conducted to evaluate the CRDs performance without interaction from aft row occupant loads. Important measurements obtained from the single row tests were the maximum excursions of the CRD and ATD. Both locked and unlocked seat backs were included in the single row tests. This test configuration is similar to the FMVSS-213 test orientation.

Double Row Tests. A number of different variables were investigated using the double row test setup. With CRDs installed in the forward row seats, it was possible to evaluate the effects of an adult occupant in the aft row impacting the forward seat back and its occupant. Placing the CRDs in the aft row provided head impact responses if the deflection of the CRD resulted in head contact of the child ATD against the forward row seat. The placement of CRDs in the aft row also provided data regarding installation problems, such as contact interference with the forward row seat and cross aisle blockage. Double row tests were also conducted with the belly belt CRD.

Vertical Orientation. The impact orientation for vertical tests was the same as specified in FAR 25.562. This is not a pure vertical impact condition. The impact velocity vector is aligned with an angle of 30 degrees below the horizontal axis of the vehicle. In this orientation, 86% of the impact momentum vector is parallel with the vertical axis of the seat. Only aft facing CRDs were tested in the vertical orientation.

Part III

Child Restraints - Performance Tests

The following results and observations from this series are arranged by the classification of CRDs as presented above. The performance of each class of CRD is summarized in the three previously defined categories of performance factors.

BOOSTER SEATS

Figure 3.1 shows a test setup with booster seats. As shown in Table 3.1, six horizontal tests were conducted with booster seats identified as CRDs A, B, C, and D. The three single row tests provided information pertaining to the physical accommodation and dynamic performance of the CRDS. One of the single row tests was conducted with locked seat backs, and two tests performed with seat back breakover allowed. The three double row tests included an adult ATD placed in the aft row seat. This configuration provided an evaluation of the combined effects of seat back breakover, aft row occupant unlap, and the booster seats with no back shell. In four of these tests, one booster seat was occupied with the CAMIX ATD instrumented to measure abdominal pressure. Head path and chest accelerations were acquired from the standard 3-year old ATD. Applying the three per-three performance factors, the results from the booster seat tests were:

1. Fit and Adjustment. The space between the arm rests on the passenger seats used for this series was 17.25 inches. One booster seat, CRD D, was too wide to be installed in this space without raising one arm rest to a stowed position. Approximately 21 inches of lateral clearance are needed for CRD D. In most transport aircraft there are seat locations with non-stowable armrests. Examples include front row seats, seats aft of cabin walls, and exit row seats. Thus, the correct installation of larger width CRDs can be dependent on location of the passenger seat. When CRD B was installed and the airplane seat lap belts were tightened over the front shield, the buckle interfered with a webbing retainer on the CRD shield. The webbing retainer could not be used. Figure 3.2 shows position of the webbing retainer relative to the buckle. Bypassing the webbing retainer did not comply with the manufacturer's instructions attached to the CRD. With CRDs A and C, the seat belt buckle was too wide for the recessed path molded in the shield. This resulted in an angle between the buckle and the correct webbing path over the shield. One effect of the incompatibility between the buckle width and webbing path over the shield is a deviation in the webbing path on the shield. The resulting path of the webbing across the shield is not according to the manufacturer's instructions. Depending on the alternative method the installer chooses for securing the lap belt over the booster, the dynamic performance of the CRD can be compromised (14).

2. Dynamic Performance. The front shield on CRD A failed during a single row test. The shield detached from the plastic tube on the left side of platform of the CRD. This CRD shield snaps on to the plastic tube when in use. Although the shield did not detach on the right side of the platform, the 3-year old ATD in the CRD translated forward and rotated over the unlatched shield. The ATD did not eject from the CRD; however, retention of the occupant was unsatisfactory as viewed from the films of the test. The exact cause of the shield failure was not identified. Post test inspection of the CRD revealed the plastic tube on the left side of the platform had deformed elastically. Discoloration on the plastic tube where deformations occurred were evident. The ATDs were retained in tests with the other three booster seats. Head excursion paths for booster CRDs B, C, and D are shown in Figure 3.3 and the measured values are indicated in Table 3.1. These data show that head contact will occur if the seat back does not move. Because these data were acquired from single row tests, there were no head impacts recorded. Thus, the HIC was not computed.

Figure 3.3 also illustrates the maximum head excursion for these three booster CRD tests. CRDs B and C exceeded the allowable forward excursion specified in FMVSS-213, though the impact pulse was a lower

severity than the automotive standard. These results demonstrate measurable performance differences for CRDs tested in airplane seats versus the approval method in the current standard.

3. Occupant Protection. A key concern for booster seats used in airplane seats is the combined effect of seat back breakover and aft row occupant impact. With no back shell, the typical booster seat does not provide protection from the forces transmitted by the airplane seat back during horizontal impact conditions. Traditionally, restraint systems in airplanes have been designed to avoid loads transmitted to the soft tissues of the abdomen. A child restrained in a booster seat may be forced against the rigid shield of the booster due to the seat back breakover action. For the intended size of children in booster seats, the load path of these breakover forces may include the abdominal region.

Shown in Table 3.1, the CAMIX ATD with abdominal pressure instrumentation was utilized in four tests with booster seats. The test matrix included abdominal pressure measurement during three different seat back breakover conditions: 1) no seat breakover; 2) normal breakover with no aft row occupant impact; 3) normal breakover combined with an aft row adult occupant impact. These are three common seat locations in transport airplanes. The quantitative results acquired from the abdominal pressure device can not be applied as an injury criterion. However, compared to the data from single row tests, there was a distinct and significant difference in the abdominal pressure response from the test condition with seat back breakover combined with an aft row adult occupant.

Shown in Figure 3.4 are abdominal pressure response data from four tests. The high-magnitude short-duration abdominal pressure pulse was recorded in test A93048, which included an aft row occupant and seat back breakover. This pressure pulse occurred simultaneously with the aft row adult ATD striking the back of the seat occupied by the CAMIX ATD restrained in a booster seat. Figure 3.5 presents a sequence of three frames extracted from high speed video recorded during test A93048. ([Click here to view CAMI SLED TEST A93048.avi](#)). There are two important observations to be noted from Figure 3.4. First, the abdominal pressure response before the aft row occupant impacts the seat back during test A93048 is similar to the responses from the other three tests, A93035, -036, and -037. The seat back was locked on tests A93035 and -037. Seat back breakover was allowed on test A93036. These three tests were conducted with no occupant in the aft row seat. Thus, there is no obvious effect on the abdominal pressure measurement due solely to seat back breakover.

Second, the peak magnitude of the pressure pulse at the time of aft row occupant contact is distinct and significantly higher than pressure prior to contact. From the time correlation of film and recorded data, the pressure pulse occurred simultaneously with the aft row occupant impact on the seat back. The peak pressure was 59.5 psig, approximately three times greater than the peaks from the three single row tests. Chest acceleration measurements acquired from a standard 3-year old ATD in booster seat tests were within the accepted limit specified in FMVSS-213 (60 Gs maximum). Figure 3.6 shows the acceleration results from these tests. The highest chest peak acceleration recorded occurred on test A93037 which was a double row test. The peak chest acceleration occurred coincident with the aft row adult impacting the breakover seat back.

Summary - Booster Seat Tests

With the four booster CRDs tested in this series, three had fit and adjustment problems. Installation difficulties with one CRD were attributed to the limited width between arm rests on the airplane passenger seat. The incompatibility between the buckle and the webbing path molded in the front shield on two booster CRDs altered the web path and buckle position of the tightened lap belts. The resulting variance in the webbing path over the front shield is not in compliance with the manufacturer's instructions, indicating that they can not be correctly installed in an airplane seat. One of the four booster CRDs failed structurally during the 16 Gpk, 44 ft/sec test. The potential for head impact on a forward row locked seat back at 32 inch pitch was measured from photometric data with 3-year old ATDs tested

in the three other booster CRDS. The maximum forward head excursion from tests with two of the CRDs exceeded the distance allowed in FMVSS-213, which has a higher severity impact test condition. The peak abdominal pressure response from the CAMIX ATD was significantly higher in the test with seat back breakover and aft row occupant impact on the seat. The highest peak chest acceleration from a 3-year old ATD was also measured in the same test configuration. Data from tests conducted with no aft row occupant impact did not exhibit a significant effect on abdominal pressure or chest acceleration due solely to seat back breakover.

FORWARD FACING CONVERTIBLE CARRIERS

Figure 3.7 shows a typical double row test with forward facing convertible carriers. Table 3.2 presents the seven tests of this series. Eight models of CRDs were tested, including one foreign device built specifically for use in an airplane passenger seat. The test matrix included five double row tests with the CRDs installed in the rear seat. The forward row seat was unoccupied and the seat backs were locked in the double row tests. All tests of forward facing convertible seats were conducted with the standard 3-year old ATD instrumented to measure head and chest accelerations. The two single row tests were conducted to measure the 3-year old ATD's head excursion with this type of CRD. The results from the forward facing device tests were:

1. Fit and Adjustment. This type of CRD is the most difficult to install in the confines of a coach class airplane passenger seat environment. Two limiting factors affect the ease of installation and proper adjustment. First, the limited space in front of normal row seats restricts the access of the installer to route and adjust the lap belts through the back of the CRD. Second, on seats with non-stowable arm rests, the width of the CRD may inhibit installation or adversely affect proper adjustment. With the lap belts routed through the backs of CRDs F and J per the manufacturer's instructions, the CRDs were unacceptably loose. This was due to vertical path of the lap belt securing the device to the seat. The CRDs could be moved forward approximately six inches, even with the lap belts adjusted to the minimum length. Dynamic tests with these loosely secured CRDs would obviously result in poor performance. To test CRDs F and J, a modified lap belt was utilized. The photo in Figure 3.8 shows the short fixed-length adaptor used to achieve an acceptable fit with these CRDS. The poor interface with the airplane lap belts resulting in a very loose fit should be considered a misuse condition.

Another characteristic common to this type of CRD was the nearly vertical angle of the airplane lap belts restraining the CRDS. When installed per the manufacturers' instructions, the path angle of the lap belts from the airplane seat attachment to the CRD ranged from 85 to 93 degrees above horizontal. This vertical load path does not produce an effective restraint of forward motion. An angle greater than 90 degrees means the seat belt anchor is forward of the CRD's belt path. During horizontal impact conditions, the CRD must translate forward until the belt path angle is significantly less than 90 degrees for belt tension forces to restrain the CRD. Automotive research has identified sin-filar effects of the belt anchorage location on the performance of child restraints (15).

CRD S, the device designed specifically for airplane passenger seats, could be installed with minimal effort. The lap belts route over a metal plate structure between the CRD's seat cushion and back. There was no interference with the buckle hardware, and normal length lap belts could be tightened manually to secure the device.

2. Dynamic Performance. Figure 3.9 shows the head excursion measured from single row test A93098 with CRD F. Due to the interface problems with this type of CRD, the forward dynamic excursion was a primary concern. The figure indicates that head contact will occur if the forward row seat back does not rotate forward. Figure 3.10 presents three frames from the high speed film recorded during test A93052

with CRD F. ([Click here to view CAMI SLED TEST A93052.avi](#)). Head excursion was not measured from double row tests, but head contact with the forward row seat back occurred with all seven of the FMVSS-213 certified models tested in this series.

The tests with CRD S, the foreign built device for airplanes, had similar results. Forward excursion of the CRD and head contact with the forward row seat resulted in a HIC of 1131. Another observation from the single row test with CRD S was the ATD submarining or sliding forward beneath the restraints. The 5-point harness prohibited complete release of the ATD. There were no significant structural failures noted in these tests. The metal insert fitting on the torso restraint integral to CRD G bent during test A93052. This fitting activates an automatic retractor mechanism that adjusts the torso restraints when inserted in the latch on the front of the CRD seat pan. The bent fitting released the tension on the torso restraint and would not re-engage the automatic retractor.

3. Occupant Protection. As noted above, head contact with the forward row seat back occurred with the eight forward facing convertible CRDs tested in the double row configuration. [Table 3.2](#) lists the HIC results from these tests. [Figure 3.11](#) shows typical head impact acceleration responses acquired from two of these tests. Six of eight of HIC results exceeded the pass/fail value of 1000. Peak chest acceleration values were all less than the 60 Gpk maximum specified in FMVSS-213.

MODIFIED SEAT BELTS TESTS

To investigate a means of reducing the horizontal dynamic excursion with these CRDS, a modified seat belt location was examined. The objective was to limit forward excursion by moving the lap belt anchor points aft and up from the normal location. The airplane passenger seat was modified to include an alternate lap belt anchor location. This anchor hardware was a common airplane seat belt attachment. The hardware is constructed of a 0.070 inch stainless steel hinged strap with a belt attachment fitting on one end.

[Figure 3.12](#) shows a photo of CRD G with the seat belts attached to the modified anchor attachment. Left and right anchors were installed as a replacement for two washers on the seat back recline pivot bolt. The anchor locations were part of the existing seat structure. The seat back recline pivot bolt location is common on many coach class seats. It is supported by the structure forming the arm rest attachment. The anchor point was located 4.5 inches aft and 4.8 inches above the normal seat belt attachment. A shortened lap belt with standard buckle and hardware was installed on these modified anchors. The shortened belts reduced the minimum adjustment length and allowed the belts to be firmly tightened. Forward facing convertible CRDs E, G, and L were tested with the modified anchor on the rear seat of a double row test.

[Table 3.3](#) lists the tests and data acquired. With these three CRDS, the angle of the lap belt path from the anchor point to contact with the CRD was 50, 30, and 65 degrees, respectively, above horizontal. The forward dynamic excursions of the CRDs and the ATDs were significantly reduced. No head contact with the forward row seat back occurred during these tests. ATD head paths from these tests are shown in [Figure 3.13](#). Peak chest accelerations from the modified belt anchor tests were less than 35 G's for all three CRDS.

Summary - Forward Facing Convertible Carriers

Two of the forward facing convertible CRDs could not be secured satisfactorily in the airplane passenger seat. HIC results were above 1000 in double row tests with six of the eight forward facing convertible CRDs tested in this series. Fit and adjustment problems, particularly with the interface to the airplane seat lap belts, were factors that resulted in forward excursion of the CRDs during dynamic tests. There were no significant structural failures. Peak chest accelerations were less than the maximum of 60 Gpk defined in FMVSS213. By moving the seat belt anchor point on the passenger seat aft to the seat back recline

pivot bolt, a more effective load path for restraining the CRDs was demonstrated. Head excursions were significantly reduced with the modified anchor point. No head contact resulted for all three CRDs tested with the new anchor point. This modified belt installation also reduced the difficulties of installing a CRD in the confined space of a passenger seat.

AFT FACING CARRIERS

Figure 3.14 is a photo of a test of aft facing CRDs in this series. Table 3.4 shows the matrix of tests with aft facing devices. Eight aft facing CRDs were tested in this project. Note that two tests with aft facing CRDs were performed in the vertical orientation. The vertical tests were conducted per the impact conditions specified in FAR 25.562, i.e., 14 Gpk with a velocity of 35 ft/sec. A photo of the vertical impact test setup is shown in Figure 2.6. There were two types of aft facing CRDS. The first type was the non-convertible "aft-facing-only" CRD. The second type was the convertible carrier CRD installed aft facing in the airplane passenger seat. Three horizontal tests in this series were double row with one aft facing CRD in the forward row and one in the aft. The seat back on the forward row seat was locked. Seat back breakover was allowed to occur on the aft row. A standard 6-month old ATD was placed in the forward row CRD, and the CRABI ATD was restrained in the aft row. Four single row tests with the CRABI ATD completed the horizontal test matrix.

The following results apply to these tests:

1. Fit and Adjustment. The non-convertible aft-facing-only CRDs M, N, P, Q, and R could be installed with minimal effort and secured tightly with the airplane lap belts. These devices fit within the available space between the arm rests. Verification of proper installation and adjustment could be confirmed by visual inspection. Quick release of the airplane lap belts and removal of the CRD were considered positive features. One characteristic common to these CRDs was the overhang into the space between seat rows. The extent of the overhang can block the movement of passengers past the CRD and inhibit the forward row passenger from reclining the seat back. Convertible carriers J and G were tested aft facing with 6-month old ATDS. With these two CRDS, the lap belts are routed over the front of the CRD in a fashion similar to the non-convertible devices. Installation, adjustment, verification, and removal are easily performed. The overhang into the space between seat rows, as noted with the non-convertible aft-facing CRDS, results in the same inconvenience to other passengers. Two factors which affected the fit and adjustment of the convertible carriers when installed aft facing were the length and attachment location of the fixed-length belt. If the insert fitting on the fixed-length belt was situated in the guide slot formed in the shell of the CRD, the lap belts could not be buckled. If the insert was positioned against a rounded surface on the CRD where the belt path transitions from horizontal to vertical, the buckle pivoted upward when lap belt tension was adjusted. As the buckle pivoted, the internal grip on the webbing was released. Thus, a secure installation could not be achieved. A longer fixed-length belt was used when these physical interference problems occurred.

2. Dynamic Performance. There were no major problems noted with the eight aft facing CRDS. Forward dynamic excursions were minimal during the horizontal tests, particularly with the aft row installations. The front overhang of the CRDs contacted the seat back of the forward row seat which prevented further horizontal movement. A significant rebound motion and contact with the breakover seat back was noted with the non-convertible CRDS. Figure 3.15 shows the maximum observed excursion of CRDs P and Q in test A93056. Examination of the films from the vertical tests showed satisfactory retention of the CRDs in the airplane seat. Forward displacement and rotation of the CRDs were minimal. Restraint of the aft facing ATDs was considered acceptable.

3. Occupant Protection. The data acquired with the CRABI ATD in these tests were reduced in

magnitude compared to the 3 year-old ATD data from the forward facing tests. An example of head and chest accelerations from the CRABI ATD in test A93056 is shown in [Figure 3.16](#). Admittedly, injury criteria based on head and chest accelerations for 6-month old children are not widely recognized. There are no head or chest acceleration criteria for aft facing CRDs in FMVSS-213. Head and chest acceleration data acquired with the CRABI ATD were considered benign.

Summary - Aft Facing CRDs

Applying the three performance factors of this project, the five non-convertible aft facing CRDs tested in this series performed well. This is the easiest type of CRD to install in an airplane passenger seat. Some of the convertible CRDs could not be secured aft facing in the airplane seat if the insert fitting on the fixed-length belt was situated in the guide slot on the CRD. The interference prohibited buckling of the belts on some CRDS, and prevented the webbing lock mechanism internal to the lap belt buckle from engaging on others. Both types of aft facing CRDs overhang the airplane seat cushion, and passage in the space between seat rows was blocked by the CRD. These CRDs' overhang may also interfere with the forward row seat back recline motion.

The dynamic performance and occupant protection for both types of aft facing CRDs were equivalent to the results expected in FMVSS-213. Also, retention of the CRD in the airplane seat and restraint of the ATD were considered acceptable from the vertical tests with these devices. The effects of seat back breakover combined with an aft row adult ATD impact forces were not investigated in this matrix of tests. All of the aft facing devices had rigid side walls which should inhibit seat back intrusion on the occupant. The limited instrumentation in the 6-month size ATDs used in these tests might not provide an adequate assessment of the forces resulting from this test condition. Tests with an aft row adult ATD impacting the seat with an aft facing CRD were proposed as a future project with additional instrumentation in the ATD.

HARNESS RESTRAINTS

One harness type restraint device, CRD T, was tested in this project. Shown in [Figure 3.17](#), this particular model was designed for children in the weight range of 25 to 40 pounds. The CRD Nk-as constructed as a torso harness with padded adjustable straps over the shoulders and around the waist. A Gz strap (crotch strap) was included on this CRD. The shoulder and abdomen straps were attached to a rectangular metal plate, approximately 10 x 9 inches wide, positioned on the back of the ATD. The airplane seat lap belts were routed through a loop of webbing attached to the metal back plate on the CRD per the manufacturer's instructions. Two single row tests with this device were performed. The following observations were noted from two dynamic tests:

1. Fit and Adjustment. Ease of installation and adjustment on the 3 year-old ATD were positive features with this CRD. Placement of the device on the child may be performed before the child sits. There were no interference problems with the seat dimension, and routing of the lap belts to secure the device was simple. However, the short path of the airplane seat lap belts through the back of the harness results in a loose restraint between the occupant and seat. With the lap belts adjusted to the minimum length, the ATD could be moved forward approximately 7 inches before tension was developed in the belts. This was considered unsatisfactory for testing.

At the manufacturer's suggestion, the test was conducted with a small air mattress placed between the ATD and the seat back. The purpose of the mattress was to move the occupant forward approximately 3 inches to reduce the slack in the restraint as well as improve the angle of the lap belt path. The air mattress was not sold with this CRD, and the FMVSS-213 approval tests of the CRD did not include the mattress.

2. Dynamic Performance. Gross ATD excursion was observed on the films from the first test with CRD T. The ATD moved forward and over the front edge of the seat cushion and proceeded to submarine toward the floor. Elasticity in the webbing of the harness and the lap belts then heaved the ATD rearward. The force pulling the ATD back into the seat appeared to be applied by the Gz strap directly through the pubic symphysis of the pelvic bone. Three high speed video frames from a frontal view of test A93041, shown in [Figure 3.18](#), illustrate the excursion and submarining of the ATD. The excessive excursion and vertical displacement of the ATD were obviously unsatisfactory. ([Click here to view CAMI SLED TEST A93041.avi](#)). A modified installation method was attempted on the second test with this harness. Plastic trim on the side of the seat below the arm rests was removed. The airplane lap belts were wrapped around the tubular frame of the seat exposed by removing the plastic trim. This effectively shortened the lap belts and in effect moved the belt anchor point by approximately 5 inches aft and up. The lap belt webbing was twisted numerous times in an attempt to stiffen and further shorten the belts. This modified belt arrangement was used to secure the harness for the second test. The observed motion of the ATD during the second test was reduced compared to the first test. No submarining or gross forward excursion of the ATD were observed.

3. Occupant Protection. There were no injury criteria data acquired from these two tests. The observed motion of the ATD in the first test was considered unsatisfactory restraint of the occupant. A subjective assessment of poor performance in overall protection of the occupant was concluded from the films of the first test. The results of second test were considered successful in reducing the occupant excursion.

Summary - Torso Harness CRD

Due to the limited adjustment range and anchor location of the airplane seat lap belts, the harness restraint could not satisfactorily restrain the motion of the 3 year-old ATD. When installed per the manufacturer's instructions, the loose tension of the lap belts did not provide a secure restraint. The experiment with an air mattress as a spacer between the ATD and the seat back on these tests did not significantly affect the poor interface between the harness and lap belts. Gross displacements, forward and down, were observed from the first test. Modifying the seat and rigging the lap belts through an elaborate wrap-and-twist procedure produced improved results on the second test. However, the modified installation method would not be practical or even possible with most airplane seats.

LAP HELD CHILD RESTRAINT (BELLY BELT)

One device approved by the Civil Aviation Authority of England for the restraint of lap held children less than 2 years-old in airplanes is called the "belly belt." This is a short loop of webbing with standard buckle hardware installed on the ends. The belt is buckled around the child's abdomen. It is secured to the adult's belts by routing the seat belts through a small loop of webbing sewn on the belly belt. Thus, the child is restrained by an abdominal belt attached to the adult's lap belt.

The belly belt is not certified under any automotive standard. In fact, carrying a child on the lap in a moving automobile is illegal in the United States. Some belly belts are labeled as meeting the requirements of FAA TSO C22, basically a static strength standard for aviation restraints. There are no known performance standards for the belly belt. A pretest photograph of the belly belt installed on the CAMIX ATD is shown in [Figure 3.19](#). The four tests conducted with the belly belt are listed in [Table 3.5](#). Two key effects of the belly belt restraint were investigated in these tests. First, the ATDs were instrumented to measure abdominal pressure resulting from restraint loads concentrated on the abdomen. Second, tests were conducted to observe and measure potentially injurious contact forces on the lap held child created by the adult flailing and impacting the forward row seat. The effects of aft row occupant

impact combined with seat back breakover were included in the fourth test, A94165.

The results of the belly belt tests were:

1. Fit and Adjustment. This factor is not an issue for the belly belt. The simplicity of the device makes it the easiest to install and adjust. Unfortunately, the installed device is fitted and adjusted directly across the abdomen of the child.

2. Dynamic Performance. The forward translation and rotational flailing of both the adult and lap held ATDs resulted in severe body impacts against the forward row seat during the double row tests, A93040 and A93050. In both tests, the child ATD moved forward to impact the forward row seat back, followed by the adult ATD torso striking the child ATD. The rotational motion of the adult ATD torso continued after contact with the child ATD, crushing the child ATD against the seat back. Figure 3.20 is a film frame showing the adult and child ATD positions immediately prior to contact on the forward row seat back.

3. Occupant Protection. One single row test, A93039, was performed with the CAMIX ATD restrained in a belly belt while sitting on the lap of a 50th percentile male ATD. To prevent forward flail of the adult ATD, its upper torso was tied with cord to a test fixture. The purpose of this protocol was to measure abdominal pressure due solely to the belly belt on the child ATD. The abdominal response from this test is shown in Figure 3.21. Compared to abdominal responses from booster seat tests with no aft row occupant, the peak abdominal pressure from test A93039 was 50% higher (30 psig).

A second test with the CAMIX ATD, A93050, was a double row test with the adult/child combination in the aft row. The adult ATD's upper torso was not restrained in this test. The abdominal response from this test is also shown on Figure 3.21. Peak abdominal pressure from the double row test was not significantly different from the single row test result. The third test of the same adult/child combination was tested in the forward row of double row test A94165. An adult size ATD occupied the aft row seat. The forward row seat, occupied by the CAMIX on an adult ATD, had a breakover seat back. The peak abdominal pressure response from this test, presented as the third data trace in Figure 3.21, occurred coincident with the aft row adult ATD striking the breakover seat back. As noted in the discussion of the booster seat tests, there was evidence from this data of a causal relationship between abdominal loads and aft row occupant impact.

The abdominal pressure transducer was installed in the CRABI ATD for test A93040. A pressure of 44 psig was recorded in this double row test with the lap held CRABI ATD in the aft row. Figures 3.22 and 3.23 show the abdominal pressure response and the resultant head acceleration from the CRABI ATD in this test. The obvious peaks on both data traces identify the time of contact from the adult ATD against the back of the child ATD. The HIC result from the CRABI ATD was 1913.

Summary - Lap Held Child Restraint

The data and observations from the four tests with the belly belt did not produce any favorable results. The impossibility of protecting a small child, by any means, sitting on the lap of an adult restrained by seat belts was confirmed in these tests. Severe contact with the forward row seat back was observed during double row tests. The recorded head impact of the 6-month old CRABI ATD resulted in a HIC above 1900. Abdominal pressures from the CAMIX ATD were 50% greater than data from booster seat tests under similar conditions. Aft row occupant impact on the breakover seat back resulted in a definitive peak in the abdominal pressure data. Based on biomechanical data as well as observations of the films from these tests, the belly belt should not be construed as means of protecting small children.

NORMAL LAP BELTS

Table 3.6 describes the tests conducted with normal airplane seat lap belts. The first test was conducted with the 24 month-old CAMIX ATD restrained by lap belts. Seat back breakover and aft row occupant impact forces were not included on the first test. The second test had 3-year old ATDs restrained by the normal lap belts in the forward and aft row of a double row test. A third test had an adult ATD in the aft row with a lap belt restrained 3-year old in the forward row. The final test with normal lap belts included the CAMIX restrained in a seat with a breakover back in the forward row, and an adult size ATD in the aft row. The 6 month-old size test dummies were too small for the minimum adjustment range of the lap belts. Also, it is universally acknowledged that children weighing less than 20 pounds can not be safely restrained in a forward facing restraint. Methods of adapting the lap belts over a 6 monthold size ATD, such as adding pillows or blankets around the occupant, were not investigated. Results and observations from tests with lap belts were:

1. Fit and Adjustment. The conventional definition of proper seat belt accommodation is a tight fit of the belt when routed and adjusted over the pelvis of the occupant. With the 24 month CAMIX ATD, the fit and path of the lap belts were marginal by this definition. Although the lap belts were not slack when adjusted to the minimum length, the ATD was not tightly coupled to the seat. A longer fixed-length strap on the lap belts would prevent acceptable tension adjustment. The path prevent acceptable tension adjustment. The path of the belts across the ATD was low across the pelvis.

The accommodation of the seat belts was considered acceptable for the 3 year-old ATDs used in these tests. A tight fit could be attained by normal manual adjustment, although the adjusted length was near the minimum for these lap belts. The path angle of approximately 80 degrees above horizontal was measured from the belt anchor to pelvic contact on the ATD. This angle exceeded the recommended belt angle (45-55 degrees) for adults. However, the path of the belts was below the iliac crests of the pelvic bone, and belt intrusion onto the abdomen was not likely with this path. The minimum size of occupant that could be accommodated by the airplane seat lap belts was not addressed in this project. Lap belts for an occupant with a smaller pelvic breadth than the 3 year-old ATD may not provide a tight fit due to the limited adjustment range. The sitting posture of a smaller occupant and size of the pelvis also will affect the lap belt accommodation geometry.

2. Dynamic Performance. Figure 3.24 presents three film frames showing the aft row 3 year-old ATD head flail from test A93046. ([Click here to view CAMI SLED TEST A93046.avi](#)). The aft row ATD's head did not strike the seat back. A film analysis of the test revealed elastic deflection of the A93046 forward row seat provided clearance for the head to miss the seat back. Head movement continued in a curved downward path. Both ATDs'heads hit the front frame of the seat it occupied. Retention of the occupant, while maintaining the restraint loads across the pelvis, was observed in the films.

The head paths from tests with the CAMIX and 3 year-old ATDs restrained in lap belts are shown in Figure 3.25. One explanation of the greater head excursion for the CAMIX ATD was the marginal fit and path of the lap belts on the smaller ATD. The relatively loose fit of the belts allowed the ATD to move forward further than the 3 year-old ATD. There was no indication of submarining or roll out with the CAMIX in lap belts. After the maximum forward excursion, downward and aft motion continued and the CAMIX ATD's head struck the front spreader tube of the seat in which it occupied. An adult ATD was placed in the aft row seat for the third test, A93047. The forward row seat, which had normal seat back breakover, was occupied by a 3 year-old ATD. During the impact, the adult ATD impacted the forward row seat back, forcing the seat back to collapse on the child ATD in the front seat. The flail motion of the child ATD in the front seat was not notably different from that of the aft row ATD in the first test. As noted on the previous test, the 3-year old ATD's head contacted structure on the front of the seat it occupied.

3. Occupant Protection. Head impact accelerations of the aft row ATD in test A93046 and the front row ATD of test A93047 are shown in [Figure 3.26](#). HIC results from these tests were 822 and 1002 respectively. Chest acceleration from these tests both peaked near 35 G's. Head velocity, derived from motion analysis of the head path of the aft row child ATD, is shown in [Figure 3.27](#). The velocity of the head as it passed within 1.2 inches of the forward row tray table was 38 ft/sec. Variables such as shorter seat pitch and a greater seat back stiffness would increase the potential for high velocity head strike on the forward row seat back. These tests did not evaluate the effects of a "brace-for-impact" position with child ATDS. A reduction in the head excursion distance and velocity would be expected with a braced occupant.

Abdominal pressure from the double row test A94164 with the CAMIX in the forward row seat with a breakover back are presented in [Figure 3.28](#). The data in this figure are overlayed with the abdominal pressure from test A93038, which was conducted with a locked seat back and no aft row occupant. These data indicate an increased abdominal pressure due to seat back breakover combined with aft row occupant impact. An examination of the film from test A94164 showed the lap belts remained across the pelvis of the CAMIX ATD during the impact. The stimulus for the higher abdominal pressure was apparently due to the abdomen bearing on the thighs and seat cushion. It did not appear to be due to the lap belts loading the abdomen.

A comparison of CAMIX abdominal loads from booster seat test A93048 and lap belt test A94164 are shown in [Figure 3.29](#). Both tests were conducted with breakover seat backs and an aft row adult ATD. The peaks on both data sets occurred coincident with aft row occupant impact. Higher abdominal loads from the booster seat test were attributed to the rigid shield of the CRD bearing on the abdomen.

Summary -Normal Lap Belts

The fit and adjustment of airplane seat lap belts used to restrain the 3 year-old ATDs was satisfactory, although the lap belts were near the minimum adjustable length with this size occupant. Results and observations from dynamic tests with lap belt restrained 3-year old ATDs indicated the basic performance of lap belts with 3 year-old 33 pound occupants was marginal by existing standards. Other potential injury mechanisms associated with lap belts were not addressed in this project. The minimum age or size of occupant that would be accommodated properly, as defined by fit and adjustment of the belts, was not determined. Accommodation of the CAMIX ATD in lap belts was considered marginal. A tight fit was not achieved with the minimum length adjusted belts. The relatively loose fit of the belts and the smaller size pelvis of the CAMIX resulted in a greater head excursion than observed with the 3 -year old ATDS. A head strike against seat structure in the seat which a 3-year old ATD occupied was recorded during two tests. The HIC result calculated from one of the head strikes was 1002, which is unacceptable by the criteria in both FAA and NHTSA regulations. Slight variations in the seat pitch or dynamic deflection of the seats could result in head contact with the forward row seat. Motion analysis of the 3-year old ATD's head path during these tests revealed the potential for high velocity head impact on the forward row seat. If the seat pitch was reduced or the seat back did not move during the impact, the ATD's head would impact the tray table with a relative velocity of approximately 38 ft/sec. Abdominal loads measured with the CAMIX ATD restrained in lap belts were affected by seat back breakover and aft row occupant impact. The lap belts remained across the pelvis throughout the impact and did not appear to directly load the abdomen. However, a significant peak was noted in the abdominal response coincident with the aft row occupant striking the seat back. Caution should be exercised when comparing the performance of lap belts versus automotive CRDs presented in this report. The restraint load distribution for lap belts is concentrated across the two-inch wide path across the pelvis. These loads are usually distributed over multiple load paths with wider surfaces in automotive CRDS. Thus, the local contact forces are lower with automobile CRDS. Also, there are injury mechanisms, other than head and chest accelerations, that should be considered for lap belt restrained children (16). Automobile accident studies have identified potential injuries to the abdomen and spine associated with belt restrained children.

Part IV

Conclusions

Based on the results from the series of impact tests conducted in this project, there is sufficient evidence to conclude the following: The performance of certain types of child restraint devices does not enhance the level of safety for children in transport airplane passenger seats. The expectation of equivalent protection for children restrained in certain types of CRDs traveling by automobile can not be met in an airplane seat. A level of safety, as defined in FAR 25.562, equal to that provided for adult passengers can not be demonstrated with some CRDs when tested in transport airplane seats. In fact, these tests demonstrated some types of CRDs should not be recommended for use in airplane passenger seats. Various reasons exist for the unsatisfactory performance of some types of CRDs in airplanes. The main reason is that CRDs are designed to meet an automotive requirement, FMVSS-213, and do not necessarily adapt properly to an airplane seat. Test fixtures, restraints, and pass/fail criteria strictly specified in the automotive standard do not serve as a representative test for a CRD in an airplane seat. In particular, the restraints on airplane seats differ significantly from the test apparatus in the automotive standard. Airplane seat belts differ in anchor point geometry, tension adjustment, and buckle hardware. These differences can adversely affect the performance of a CRD designed primarily for the automobile interior.

In addition to the performance of CRDs exposed to impact test conditions, the accommodation of some CRDs is not satisfactory in airplane passenger seats. Models that require 17 inches or more of lateral space for installation may not fit in seats with fixed arm rests. Forward overhang of aft facing devices can block the passage of adjacent passengers and interfere with the seat back recline motion of the forward row seat. Depending on the specified path for routing the lap belts to secure the CRD to the seat, interference with lap belt buckle hardware can prohibit proper installation.

The airplane seat structure and close seat pitch placement in the economy class cabin are additional reasons for unsatisfactory performance with some CRDs. In the FMVSS-213 test procedure for forward facing seats, the excursion limit for the ATDs head exceeds the distance to the forward row seat back in typical economy class cabin seats. Also, the consequences of seat back breakover on airplane passenger seats, combined with aft row occupant impact on the seat back, are not considered in the automotive test procedure.

For the six types of child restraints tested in this project, the following conclusions are presented:

- o **Booster Seats** may expose the child occupant to potential abdominal injury due to the combined effects of forces imparted from the aft row occupant and seat back breakover. A peak abdominal pressure of 60 psig was acquired during a test with an aft row adult occupant striking a forward seat with an occupied booster seat. By comparison, the peak pressure was 20 psig from booster seat tests without aft row occupant interaction.

The method of measuring abdominal pressure presented in this report was experimental, and no basis was claimed for either the biofidelity of the method or the assessment of potential injury. However, the comparative difference in abdominal pressure due to aft row occupant impact was significant. Avoidance of abdominal loads due to the pelvic restraints is mandatory for the certification of modern aircraft seats. This criterion should not be neglected with child restraints. Further research should be conducted to establish the limits for abdominal loads in children.

Head excursions measured from impact tests of two approved booster seats installed on airplane passenger seats exceeded the distance allowed by FMVSS-213. The head paths of three booster seats indicated head impact on the forward row locked seat back can occur. It should be emphasized that the impact severity of all these tests was lower than the test condition of FMVSS-213. A child large enough for a booster seat can also be accommodated in the non-nal passenger seat lap belts. The performance of

lap belts, as measured by abdominal pressure and head excursion from these tests, was favorable compared to booster seat test data.

o Forward Facing Carriers are difficult to install and adjust properly in economy class passenger seats. The size of some larger carriers inhibits installation in seats with fixed arm rests. Airplane lap belts can not suitably secure some forward facing carriers in an airplane seat. The lap belt anchor point geometry on airplane seats does not afford effective restraint of forward excursion of the occupant with this type of child restraint.

In double row tests with 3 year-old ATDs restrained by forward facing carriers, all eight resulted in head impact on the forward row seat. Six HIC results were above 1000. The rigid shell and integral restraints with these carriers certainly provide protection not afforded by normal lap belts. However, the assumption that a child restrained in a forward facing carrier traveling in an airplane is protected to the same level of safety as in an automobile can not be supported by the results of this project. An alternate lap belt installation for child restraints was demonstrated as a means of reducing forward excursion of these carriers. The alternative installation tests were performed to measure the effects of improved restraint geometry. The modification to the airplane seat and the particular hardware used in the alternative method were not intended as a formal recommendation to the aviation community.

o Aft Facing Carriers, convertible as well as non-convertible models, installed in airplane seats are a definite safety benefit for children weighing less than 20 pounds. Installation and adjustment are simple and visually verifiable. The airplane seat lap belts can easily be tightened over the carrier to secure attachment of the carrier. Two factors affect passenger convenience with these devices. The forward overhang interferes with passage between the seat rows and the recline motion of a forward row seat. Performance of aft facing carriers observed in horizontal as well as vertical dynamic tests was satisfactory. Considering the other method for traveling with small children, i.e. on the lap of an adult, the use of this type of child restraint is the only available means of providing adequate protection that can be recommended.

o Harness Systems do not interface with the airplane seat lap belts in a manner which adequately restrains forward motion. The lap belts length and anchor points geometry on airplane passenger seats can not provide a firm attachment for the type of harness tested in this project. Unacceptable forward excursion of the child ATD completely off the front of the seat cushion was observed in a horizontal impact test. Only one model of a harness device was tested in this project, but the means of installing the harness was typical of other products on the market. A modified procedure of routing and twisting the lap belts around the arm rest structure resulted in improved performance. This modified procedure was not a practical alternative for the user or the airline operator.

o A Lap Held Child Restraint, or Belly Belt, should not be considered a means of protecting a child from injury during an accident.

o Normal Lap Belts can provide acceptable restraint for children of a size represented by the 3 year-old ATD used in this project. The factors which define proper seat belt accommodation are satisfied with the 50th percentile 3 year-old. These factors include an adjustable tight fit, a belt path over the pelvic bone, and no indication of submarining or roll out during dynamic tests. The adjusted lap belt was near minimum length with the 3 year-old ATD.

Accommodation of a 24-month old child in lap belts, based on tests with the CAMIX ATD, was marginal. The lap belt tension was not considered to be a snug fit when adjusted to the minimum length. However, there were no indications of submarining or roll out during dynamic tests, and the belt path remained across the pelvis. Measured abdominal pressure was increased due to the effects of an aft row adult ATD striking the breakover seat back, but they were less than the pressure acquired from the

booster seat in the same test mode.

Head impacts against the seat structure occupied by the lap belt restrained ATD occurred during tests in this project. The HIC value from one of the head impacts of a lap belt restrained 3 yearold ATD was I O02, which is an indication of head injury. These results are cause for concern. However, lap belts are not the type of restraint which inhibit upper torso flail. Head impacts were not a consequence of poor fit or adjustment with a child occupant. The performance of the lap belts with the 3 year-old ATD was considered consistent with protection afforded adult passengers in airplanes with type certificates dated prior to 1988. The HIC results above 1000 would not be consistent with adult protection criteria mandated for new airplanes.

REMARKS

These conclusions should not be construed as an indication that a dangerous condition exists for children traveling in commercial transport airplanes. The accident rate for commercial operations in 1991 was 0.32 per 100,000 departures (17), which affirms the fact that commercial aviation is a very safe mode of transportation. Rather, this information is presented to identify a particular component of passenger safety, child restraints, which may not meet the expected levels of performance in an accident. The data and observations in this report are provided to the aviation community, restraint manufacturers, and government agencies to further enhance the safety for children traveling in airplanes.

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CHILD SAFETY-RESTRAINT ISSUE TAKES NEW TURN WITH DeFAZIO BILL

The political campaign to mandate child safety restraints on airliners — gathering steam this week with a lobbying campaign by the Association of Flight Attendants — has taken a turn that has implications for the airline fare structure, some observers believe.

This is the introduction of H.R. 1141 by Rep. Peter A. DeFazio (D-OR), which would prevent an air carrier, providing scheduled air transportation to a child under three years of age, from charging a fare "that exceeds the lowest price charged by the air carrier for such air transportation to any other paying passenger on such a flight with the same final destination."

The bill's "sense of Congress" is "that air carriers should provide air transportation to children under 3 years of age at no charge." The airline industry opposes the bill.

Meanwhile, the industry is beginning to work with the automobile industry on coming up with a child seat which could be used equally well for cars and aircraft. This would build on the considerable amount of work already done by organizations such as the Society of Automotive Engineers (SAE).

H.R. 1141 follows an earlier bill introduced by DeFazio and Rep. Christopher Shays (R-CT) — H.R. 754 — which requires mandatory child-restraint seats on commercial aircraft. Said a "dear colleague" letter from DeFazio and Shays regarding H.R. 754 last month: "All 50 states have laws requiring children to use safety seats in automobiles, yet children under the age of two are not required by law to use safety seats when traveling by airplane. You buckle up your child in your car when driving 25 miles an hour, why not do

UNDERLYING CHILD-SAFETY DEBATE IS AVAILABILITY OF SEAT RESTRAINTS

Underlying the increasingly active debate about legislation requiring safety-restraint seats for airplane passengers under three years of age is whether such seats are available with full safety capability, sources say.

The Association of Flight Attendants is concerned that seats be properly tested by the Federal Aviation Administration and then approved for use. The association was this week lobbying for new congressional bills on the subject.

The Air Transport Association (ATA) is starting discussions with the automobile industry to come up with a common seat design for airplanes and cars.

ATA had petitioned FAA to require that child restraints be mandated but then backed away when some of the tested seats appeared to be dangerous for small children, an association official said. "The FAA had said that if you approve [a seat] for a car you can approve it for airplanes. Wrong. So we withdrew our petition, with the caveat that FAA should come up with a design to eliminate the head-injury criteria for children weighing 40 lb or less. They need to put some focus on that."

The source thought bills introduced by Rep. Peter A. DeFazio (D-OR) and others (see separate story) are "a little premature because if you mandate [safety seats] you have to make sure the seats are available." If the wrong seat — albeit approved by FAA — is used and a child is injured, there could be serious liability problems for an airline, this and other sources said.

One of the questions concerns whether child seats should face forward or backward. "The child seat could pitch forward in a crash and hit the seat in front, so you have a head injury," said the ATA source. FAA came out with the concept of a plastic platform that raises the child seat and avoids the head-injury problem but, said the source, "no one has come up with a design or makes the seat. FAA has not done anything with it. Our thought is fix the seat but don't build another gadget," said the source.

The Society of Automotive Engineers (SAE) has an ad hoc group "that has been trying to develop a standard for compatibility" between child seats for cars and aircraft, according to an SAE member. The standard is in the final drafting stage "but as far as developing a seat that is compatible for both, I don't think the SAE would be interested in that."

"The biggest issue is requiring that children be restrained like luggage," she went on. "There is not a real big problem with the suitability of automobile restraints for aircraft, in that they are not required. As soon as they are required, the choice would winnow down to what is the most suitable."

The requirement for a seat capable of withstanding an automobile crash is more severe than that for an aircraft — which surprises many people, the source told *Inside FAA*. An aircraft's deceleration takes much longer than a car's; aircraft seats are tested to withstand 16g and automobile seats are tested to 25g. "The biggest problem is the location of the aircraft seatbelt-anchoring system. We have to accommodate child restraints [allowing for the fact that] aircraft belts are different from car belts." However, she continued, there is a move afoot to avoid belts in automobiles and have some form of anchoring bolts or bars instead. "These could be adapted to aircraft. The technical issues are not difficult," the source added.

The underlying problem seen by another airline-industry source is "that FAA still requires children under the age of two to be seated in their parent's lap and not in a separate seat. That is a negative incentive for safety." Not all parents buy a seat for a one-year-old child, he said. "If FAA would get rid of that loophole, things would be better, but it is not a significant safety issue. There is a very small number of infants killed because of lack of restraints."

An aide of Rep. DeFazio said FAA has "to get involved in the design of the seat." DeFazio staffers intend to take their case to the new FAA Administrator. The agency is in a holding pattern at present, she said. "The airlines don't want to have to supply the seat; that is the only thing they have a problem with. But if FAA mandates it, they don't have a problem because everyone will be on the same playing field," the source said.

the same in an airplane traveling more than 500 miles per hour?"

The letter says H.R. 754 accomplishes the Gore Commission recommendation requiring all children under two to be restrained in a safety seat. FAA regulations require adults and children over the age of two to have their own seats and use seatbelts. H.R. 1141 and H.R. 754 require the Secretary of Transportation to issue new regulations requiring the use of approved child safety restraint systems. The rules would establish age or weight limits for such children. A Senate companion measure to H.R. 754, S. 398, was introduced last month by Sen. Pat Murray (D-WA).

H.R. 754 is the primary legislative vehicle as far as Rep. DeFazio is concerned, said an aide. There has been "a lot of agreement on it and the airlines aren't opposed to it. But to send a message to the airlines about what we really want, we introduced the second bill that would require the airlines to provide these seats to children at a lower cost. Ideally, they would be doing that, and we can't do it without re-regulating the airline industry." DeFazio does not want to re-regulate airline fare structures, the source stressed. The industry is opposed to H.R. 1141, she added, "so [H.R. 754] is a much more realistic vehicle."

DeFazio's staff has developed ideas on how the airlines could provide free or cheap seats for small children, the source went on. Parents traveling offpeak — when there are often empty seats available — could get a free seat for their infants,

for example. The main aim of H.R. 1141 is that a parent would not have to pay more for their child than the lowest fare paid by anyone on the same flight.

Rep. DeFazio does not accept the FAA argument that passengers might switch to driving their cars instead of flying — and thus be in greater danger — if they have to pay for child airplane seats. "We believe that airlines won't want to lose that market," said the source.

The Association of Flight Attendants is a strong supporter of the child safety-restraint legislation and brought in members to lobby for it on Capitol Hill this week. The association is pushing for cosponsors for the child-seat bills and also for House and Senate "whistleblower" legislation (*Inside FAA*, March 28, p14). The association is concerned that the child-safety issue — like several others — is languishing at the Federal Aviation Administration in the absence of a new Administrator and Deputy Administrator. (Jane Garvey, Acting Director of the National Highway Administration, and George L. Donohue, FAA Associate Administrator for Research & Acquisitions, are strongly believed to be the Clinton Administration's choice for the first and second jobs, respectively — see separate story.)

Once the new Administrator is in place, Rep. DeFazio's staff intend to make a pitch for more FAA action on the child safety-restraint issue. FAA is "the obstacle now, so we are in a holding pattern" on the issue, said the aide. "They have to get involved in the design of the seat."



U.S. Department of Transportation
Federal Aviation Administration

Tips for Parents Using Child Restraints on Aircraft

Proper use of an approved child restraint system (CRS) on an aircraft enhances child safety in the event of an accident. A CRS also provides protection for a child during turbulence. The FAA strongly recommends that all children who fly, regardless of their age, use the appropriate restraint based on their size and weight.

Before you fly

- Check with the airline to find their busiest days and times. By avoiding these times you are more likely to be on a flight with an empty seat next to a parent. In many cases, airlines will allow you to seat your child under 2 years of age in a child restraint in the empty seat without having to pay the airline fare for the child. Ask your airline for its policy regarding an empty seat.

Ask the airline if they offer a discounted fare for a child traveling in a CRS. If you buy a ticket (discounted or full fare) for your child, you are guaranteed that they will have a seat, and that you will be able to use the CRS.

- If you purchase a ticket for your child, reserve adjoining seats. A CRS should be placed in a window seat so it will not block the escape path in an emergency. A CRS may not be placed in an exit row.
- Check the width of your CRS. While airline seats vary in width, a CRS no wider than 16" should fit in most coach seats. A CRS wider than 16" is unlikely to fit. Even if the armrests are moved out of the way, a wide CRS will not fit properly into the frame of the aircraft seat.
- If you need to change planes to make a connecting flight, it can be very challenging to carry a CRS, a child, and other items through a busy airport. Most airlines will help parents make the connection. Request that the airline arrange for assistance in your connecting city.

Choosing the correct CRS

Always follow the manufacturer's instructions regarding use of the CRS. Do not place a child in a CRS designed for a smaller child. Be sure that any shoulder straps in the CRS come out of the CRS seat back above the child's shoulders. Tighten the aircraft seat belt around the CRS as tightly as possible.

- **Under 20 pounds** - use a rear facing child restraint.
- **From 20 to 40 pounds** - use a forward facing child restraint. Although the safety technology of forward facing carriers in aircraft is still developing, current devices offer dramatic improvements in protection compared to lap held and/or unrestrained children.
- **Over 40 pounds** - A child over 40 pounds may safely use an aircraft seat belt and does not require a CRS.

Reminder

Use an approved CRS when traveling to and from the airport by automobile. Booster seats and harness vests do not provide adequate protection and are banned for use on aircraft, but they do enhance safety in automobiles. These devices may be checked as baggage. In the United States, supplemental lap restraints, "belly belts," are banned from use in automobiles and aircraft.

For more information, call:

1-800-FAA-SURE (1-800-322-7873)

Online access is available through:

The FAA web site: [http:// www.faa.gov/apa/apahome.htm](http://www.faa.gov/apa/apahome.htm), look in the publications area.

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NTSB Recommendations to FAA and FAA Responses Report

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Data Source: NTSB Recommendations to FAA and FAA Responses

Rprt_Nbr: A-93-106

Last Updated: 12-04-96

[O] On September 6, 1992, involving a Piper PA-30, N7065Y, operating under the provisions of 14 CFR Part 91, entered an uncontrolled descent and crashed at Broussard, Louisiana. Parts of both wings and both horizontal stabilators separated before the airplane struck the ground. The flight, which was en route from Slidell, Louisiana, to Killeen, Texas, carried two adults and two children. The adult male who occupied the right front seat sustained fatal injuries. Although the impact involved high vertical and side loads, the adult male who occupied the left front seat and a 4-year-old boy and a 10-month-old girl who occupied the rear bench seat in child restraint systems survived the accident with serious injuries. The occupant in the left front seat sustained a fracture of the thoracic spine, a ruptured spleen, liver laceration, and a pneumothorax. The 4-year-old boy sustained a closed head injury, a basilar skull fracture on the right side, and fractures of the right ulna, radius, and fibula. The 10-month-old girl sustained a closed head injury.

Recommendations:

A-93-106. Amend 14 CFR Parts 91, 121, and 135 to prohibit two or more persons from using a safety belt that is designed for one person, regardless of age.

Responses:

FAA LTR DTD: 11/17/93

Presently, 14 CFR Parts 121 and 135 do not allow the use of one seat belt for more than one person if that person is over 2 years of age. Airlines prohibit an adult to fasten a restraint system around that adult and an infant. Consequently, the effect of the regulations and airline policy is that two or more persons are prohibited from using a seatbelt designed for one person, regardless of age, during 14 CFR Parts 121 and 135 operations.

With regard to general aviation aircraft, 14 CFR Part 91 does not prohibit the use of one safety belt by more than one person. The Federal Aviation Administration (FAA) will issue advisory material which will discuss the safety hazard of having a child under the age of two fastened within an adult safety belt. The FAA is examining the issue of two persons seated side by side in a dual seat wearing the same safety belt. The FAA will ask the Civil Aeromedical Institute to conduct research to establish the crash injury potential when two people seated side by side are restrained by one safety belt.

I will keep the Board apprised of the FAA's progress on this safety recommendation.

NTSB LTR DTD: 7/12/95

We apologize for the oversight in not advising the FAA of the Board's evaluation of the FAA response to Safety Recommendation A-93-106 in a timely manner. Safety Recommendation A-93-106 asked the FAA to amend 14 CFR Parts 91, 121, and 135 to prohibit two or more persons from using a safety belt that is

designed for one person, regardless of age. After a thorough review of the FAA's response, the Board has agreed that the combined effect of existing regulations that prohibits the use of one seat belt for more than one person if that person is over 2 years of age, and airline industry policy that prohibit an adult from fastening a restraint system around an adult and an infant, achieve the goal for Part 121 and 135 operations. With respect to Part 91 operations, the Board believes that the FAA's educational effort that began as a response to Safety Recommendation A-93-107 is more effective way to address the intent for operations under this part. However, since the FAA has stated that the Civil Aeromedical Institute (CAMI) will be asked to look into the hazards associated with two persons seated side by side while restrained by the same seat belt, Safety Recommendation A-93-106 is classified "Open--Acceptable Alternate Response" pending the Board's review of the results of any relevant research performed by CAMI.

FAA LTR DTD: 7/30/96

On July 12, 1995, the Board stated that the combined effect of existing regulations that prohibit the use of one seat belt for more than one person if that person is over 2 years old and the airline industry policy that prohibits an adult from fastening a restraint system around an adult and an infant achieve the goal for 14 CFR Part 121 and 135 operations. The Board further stated that with respect to 14 CFR Part 91 operations, the Federal Aviation Administration's (FAA) educational effort that began as a response to Safety Recommendation A-93-107 is a more effective way to address the intent for operations under 14 CFR Part 91. The Board classified this safety recommendation in an open acceptable status.

The FAA has revisited its position in response to this safety recommendation, and on June 4, 1996, the FAA published a final rule entitled **Child Restraint Systems**. This final rule amends 14 CFR 91.107(a)(3)(i), 121.311(b)(1), 125.211(b)(1), and 135.128(a)(1) to state that a person may be held by an adult who is occupying an approved seat or berth provided the **child** has not reached his or her second birthday and the **child** does not occupy or use any restraining device.

This final rule prevents an adult and **child** from using one seatbelt. In addition, the final rule withdraws FAA approval for the use of booster seats and vest- and harness-type **child** restraint systems in aircraft during takeoff, landing, and movement on the surface. It also emphasizes the existing prohibition in all aircraft against the use of lap-held **child** restraint systems (including belly belts and seat belt extensions). I have enclosed a copy of the final rule for the Board's information.

I consider the FAA's action to be completed on this safety recommendation.

NTSB LTR DTD: 11/26/96

On June 4, 1996, the FAA published a final rule entitled "**Child Restraint Systems**," which amended 14 CFR Parts 91, 121 and 135. This amendment permits a **child** under 24 months to be held by an adult who is occupying an approved seat or berth, provided that the **child** has not reached his or her second birthday and the **child** does not occupy or use any restraining device. This rule thus prohibits an adult and **child** from using the same seatbelt.

The Safety Board continues to believe that all occupants, regardless of age, should be restrained for takeoff, for landing, and during turbulent conditions and urges the FAA to require approved restraint systems for all occupants. However, because the amendment to the regulations satisfies the intent of the recommendation, the Safety Board classifies Safety Recommendation A-93-106 "Closed Acceptable Action."



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Data_Source: NTSB Recommendations to FAA and FAA Responses

Rprt_Nbr: A-90-79

Last Updated: 07-11-95

[O]

On July 19, 1989, a McDonnell Douglas DC-10-10, operated by United Airlines as flight 232, en route from Denver, Colorado, to Chicago, Illinois, experienced an in-flight emergency following the fragmentation and separation of the No. 2 engine fan disk. The airplane crashed during an attempted emergency landing on runway 22 at Sioux Gateway Airport, Sioux City, Iowa.

During the ground impact sequence, the airplane separated into sections and portions burned. The center section of the airplane, which contained most of the passengers, came to rest inverted in a cornfield adjacent to runway 17 and 3,700 feet from the initial impact on runway 22. Of the 296 persons on board the airplane, 110 passengers and 1 flight attendant were fatally injured. Autopsies revealed that 35 passengers died of smoke inhalation, including 24 without traumatic blunt force injuries. The others who were fatally injured died of multiple injuries from blunt force impact. Of the remaining 185 persons on board, 47 sustained serious injuries, 125 sustained minor injuries, and 13 were not injured.

Recommendations:

A-90-79. Conduct research to determine the adequacy of aircraft seatbelts to restrain children too large to use **child** safety seats and to develop some suitable means of providing adequate restraint for such children.

Responses:

FAA LTR DTD: 8/6/90

The Air Transport Association of America is sponsoring a joint FAA/Society of Automotive Engineers (SAE) committee to address **child** restraint issues. The committee will include participation from the Aerospace Council and the Motor Vehicle Council, as well as representatives from Great Britain and Canada.

Since the Sioux City accident, the FAA has received numerous ideas, suggestions, and inventions from the general public to enhance **child** safety on airlines. The FAA/SAE committee will consider the merits of all of the information received during its review of the **child** restraint issues.

I will apprise the Board of the FAA's course of action to address this safety recommendation as soon as the review is completed.

NTSB LTR DTD: 1/28/91

The FAA response describes an FAA/Society of Automotive Engineers (SAE) committee which is to discuss **child** restraint issues.

According to a Safety Board staff representative who attended the March 27, 1990, meeting of the committee, it is not addressing the specific issue raised by Safety Recommendation A-90-79: **child** size or the child-seat capability in terms of **child** size and weight limits. Rather, the SAE describes this as "a yet-to-be-determined FAA age or size limit." Although the committee plans to refer the issue to the ATA

Cabin Operations Panel, to our knowledge the issue has not been accepted as a topic for discussion. Therefore, Safety Recommendation A-90-79 is classified as "Open--Unacceptable Response."

FAA LTR DTD: 6/7/91

The FAA has conducted considerable research and testing in child restraint, much of which was conducted in cooperation with the National Highway Traffic Safety Administration and other professional organizations. The FAA has reviewed its findings of past research, conferred with other experts in the field (including members of the Society of Automotive Engineers Ad Hoc Committee on Child Restraint), and concluded that an additional special restraint is not needed. The FAA believes that an adult lap belt provides adequate restraint for an ambulatory child who has attained a height of at least 30 inches. Previous studies have also concluded that an adult lap belt is adequate for a child close to 1 year of age, provided that child has attained muscular and skeletal development and weight distribution (i.e., no longer "top heavy") to enable him/her to walk. The FAA believes that these conclusions are further supported by the fact that the 27-month old boy in seat 17G of the accident aircraft was secured throughout the impact sequence and was not injured.

Based on the above, I do not believe that further studies on this subject are necessary. I consider the FAA's action to be completed, and I plan no further action on this safety recommendation.

NTSB LTR DTD: 5/8/92

The Safety Board notes that the FAA has reviewed its findings of past research and has concluded that the adult lap belt provides adequate restraint for "a child close to 1 year of age," provided that the child has attained muscular and skeletal development and weight distribution that enables him/her to walk. The FAA has also concluded that a special restraint is not needed for an ambulatory child who has a height of at least 30 inches. The Safety Board notes that these conclusions represent a change to an earlier finding that was contained in the FAA's Office of Aviation Medicine Report (AM 69-22), entitled "Determination of Centers of Gravity of Infants." The report concluded: "Not until the child reaches his fifth or sixth year has the c.g. [center of gravity] dropped sufficiently and the pelvis developed enough in size to allow the seatbelt to be used as a safe and effective restraint device."

In view of the FAA's recent finding, the Safety Board would appreciate learning of published research that supports this finding that an adult seatbelt can effectively and safely restrain, without injury, children of about 1 year of age under the conditions specified in TSO C-100a and the crash impact and in-flight turbulence inertia forces specified in the Federal Aviation Regulations. The Safety Board remains concerned about the ability of adult seatbelts to safely restrain small children.

The angle that a seatbelt makes as it passes over the iliac crests of the pelvic girdle and the distance between the left and right seatbelt attachments are designed to accommodate a diverse anthropometric population of adult males and females. Because small children do not have fully developed pelvic girdles, seatbelts typically are mispositioned over their upper thighs or over their abdomens and there is excess lateral space between the child and the seatbelt attachments. The child can easily move laterally inside the seatbelt during side loads or be thrown out of the seatbelt during longitudinal and vertical loads. Depending upon the position and tightness of a seatbelt, the rebound characteristics of seat cushions during dynamic crash forces or during cyclic positive and negative forces in turbulence impose multiaxial loads upon soft abdominal organs rather than upon the iliac crests. The potential for serious injuries is further increased when the seatbelt release buckle is positioned over the abdomen.

Loosely adjusted and, thus, mispositioned seatbelts can afford adults some degree of security and some

protection from serious injury during unexpected in-flight turbulence. Unfortunately, during turbulence a loosely worn seatbelt cannot afford a child the same degree of security because the seatbelt can cause serious internal injuries and allow the child to slip out from under the seatbelt. Finally, the Safety Board believes that it is unreasonable to expect small children to be able to maintain, without almost constant supervision, the proper position and tightness of seatbelts.

The Safety Board has learned that the Society of Automotive Engineers' Ad Hoc Committee on Child Restraint has yet to fully examine the topic of the use of adult lap belts to restrain children.

The FAA conclusion that "an adult lap belt provides adequate restraint for an ambulatory child who has attained a height of at least 30 inches" is not supported by the Safety Board's study of the performance of lap belts in frontal vehicle crashes that was published on July 28, 1986. [Safety Study Performance of Lap Belts in 26 Frontal Crashes, NTSB/SS-86/03.] Twenty children whose ages ranged from 2 years to 6 years and whose heights ranged from 36 1/2 inches to 52 inches were involved in some of these accidents. The lack of upper torso restraints and mispositioned lap belts caused injuries that ranged from minor to fatal. These findings further reinforce the Safety Board's concerns that adult seatbelts cannot afford effective and safe restraint of children who have outgrown child safety seats. The Safety Board urges the FAA to reconsider its response to this recommendation. Pending receipt of the published research that supports the FAA position, this recommendation is now classified as "Open--Unacceptable Response."

FAA LTR DTD: 7/12/93

In April 1993 the Civil Aeromedical Institute (CAMI) conducted dynamic impact tests with 35-pound, 3-year-old anthropomorphic test dummies (ATD) restrained by the seatbelt in a passenger seat. Under the horizontal test conditions specified in 14 CFR 25.562, there was no evidence of occupant roll-over or submarining about the seatbelts. No head contact occurred with the forward row seat at 31-inch seat pitch. The ATD's head did strike the front of the seat in which it was sitting and the measured head impact accelerations were significant. However, test results indicated that any resultant head injury would be within the limits established in 14 CFR 25.562.

Other tests were conducted with a 27-month-old ATD restrained by seatbelts. Again, there was no evidence of submarining or roll-over of the ATD during the 16g impact. An experimental pressure-sensing abdominal insert was included in the 27-month-old ATD. The recorded pressure response did not indicate that the seatbelt loads were directed through the abdomen of the ATD. Although there were no injury criteria established for abdominal loads, biomechanical studies of abdominal impacts support the hypothesis that the injuries were related to pressure loading. The pressures recorded from the test with seatbelts were lower than those acquired with other restraint devices (i.e., booster seats and belly belts).

Based on the preliminary results of the CAMI tests, the FAA believes that seatbelts provide an adequate level of protection to children in the 27-month/26-pound to 3-year/35-pound range when exposed to the impact conditions of 14 CFR 25.562. Although the tests were not conducted using a larger ATD as requested in this safety recommendation, the FAA believes that the results of the CAMI tests using the 3-year/35-pound ATD indicate that children who weigh more will be provided the same minimum level of protection. In fact, children who weigh more than 40 pounds will have better fit and adjustment capability in the seatbelts than smaller children.

I believe that the FAA has thoroughly addressed this safety recommendation. I consider the FAA's action to be completed, and I plan no further action.

NTSB LTR DTD: 5/16/95

Per NTSB green sheet dated 5/16/95, Safety Recommendations A-95-40 through -51. The Safety Board is satisfied with the FAA's action regarding the study of child restraint systems; thus, Safety Recommendation A-90-79 is classified "Closed Acceptable Action." Also because CAMI found that normal lap belts can provide acceptable restraints for 3-year-old children, the Safety Board finds that the 40 pounds, 40 inch standard used in Safety Recommendations A-90-78 has been superseded by the findings of the CAMI report. Since the FAA has not taken steps to require that all occupants be restrained during takeoff, the Safety Board now classifies Safety Recommendation A-90-78 as "Closed Unacceptable Action/Superseded."



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Data_Source: NTSB Recommendations to FAA and FAA Responses

Rprt_Nbr: A-83-1

Last Updated: 09-21-94

[O] There has been a significant increase in the past 2 to 3 years in the awareness of the traveling public and safety-related government agencies of the need to protect infants and small children from the risks inherent in transportation. Since children travel mainly by motor vehicle, most of the attention on child passenger safety has been focused on this mode. It is estimated that five million child car safety seats are in use today, and another two million are being purchased each year. Since 1977, 19 states have passed laws requiring use of child safety seats during motor vehicle travel. The National Transportation Safety Board recently wrote to the remaining States and the District of Columbia, urging that similar mandatory child protection laws be introduced and that effective child restraint education and enforcement programs be initiated.

Among the areas of transportation crash protection most neglected over the years is that for infants and small children during air travel. The Safety Board is concerned that such protection has not been forthcoming in this important area.

Recommendations:

A-83-1. Amend TSO C-100 to permit the use of any infant or child restraint device bearing a label in conformance with 49 CFR 571.213, §5.5.2 (e) aboard aircraft during takeoff, landing, and in-flight operations, until such time as the FAA and the National Highway Traffic Safety Administration issue standards for devices acceptable for use in both motor vehicles and aircraft.

Responses:

FAA LTR DTD: 3/11/83

The FAA is as concerned as the Board over the need for improved child restraint systems in aircraft. This is evidenced by: (1) the pioneering dynamic crash tests conducted on child restraints at the Civil Aeromedical Institute (CAMI); (2) FAA work with the National Highway Traffic Safety Administration (NHTSA) to develop a common standard for child restraint devices; (3) a special FAA study in 1979, in which NHTSA participated, to recommend the best way to implement child restraint device usage in aircraft; (4) numerous meetings with NHTSA staff up to and including the administrator level over a 9-month period to evaluate NHTSA's desire to allow Federal Motor Vehicle Safety Standard (FMVSS) No. 213 seats on aircraft without further compliance testing; (5) several discussions with the Board's staff to explain in much detail the reasons that the FAA considered the extra tests of Technical Standard Order (TSO) C100 to be necessary; and (6) meetings and discussions with child restraint manufacturers to explain what was needed to demonstrate compliance with TSO-C100, including assisting Calspan Corporation in developing a standard test procedure to demonstrate compliance with TSO-C100. In addition the FAA has made its representative aircraft seat available to anyone who wishes to use it to conduct the testing required by TSO-C100. While we have always agreed with the ultimate safety objective desired by the Board, we cannot concur with the Board's approach to achieving that objective. The FAA has not neglected crash protection "for infants and small children during air travel," as stated by the Board. Our activities are a matter of public record and in no way show neglect by this agency.

The FAA has specified the 20 mile per hour (MPH) test in TSO-C100 because there is a safety need to

evaluate the interaction of the typical 16-pound aircraft seat back, that is free to fold over during a crash with the child/infant in the child restraint device, especially when the child/infant is facing aft. This possibly injurious condition is not evaluated during testing to FMVSS 213, as that standard specifies a rigid automobile seat back. The mere fact that most presently produced devices pass the test in no way obviates the legitimate need for the test. The FAA recognizes that many of the present FMVSS 213-approved child restraint devices can meet the TSO-C100 requirements, but at least one child restraint device manufacturer has indicated that some FMVSS 213-approved devices will not meet TSO-C100 and are considered by that manufacturer to be clearly unsafe in the aircraft environment. It is not hard to imagine a realistically designed child restraint device that can meet FMVSS 213 and be unsafe in the aircraft environment.

A second area that seems to have played a large part in the Board's recommendation is the fact that the Head Peak Acceleration and Head Injury Criterion measurements during the Calspan Corporation TSO-C100 tests were below those values measured during the FMVSS tests, thus implying that the TSO-C100 tests produced injury potential below that permitted in FMVSS 213. As discussed with the Board's staff, the FAA has always expected that the 20 mph test in TSO-C100 with a representative aircraft seat design would produce body accelerations less than the same 20- (or, higher, 30-) mph test per FMVSS 213 with the specified typical automobile seat. It is not injuries produced by such acceleration values alone that the FAA is concerned with in specifying the 20 mph test. It is potential injuries produced by the crushing of the child/infant by the aircraft seat back, especially for the rearward facing child, that the test is designed to evaluate and preclude. This crushing injury is not merely a function of acceleration, but is an important function of the dynamic behavior of the restraint design in combination with an aircraft (not a car) seat. This injury potential must be evaluated on a case by case basis by viewing high-speed films of the test. In a well-restrained, rearward-facing child restraint device, the body accelerations may be exceedingly small, yet the child/infant could be killed or seriously injured by the 16-pound seat back reaching an acceleration of up to 36g's and producing a total crushing force of 576 pounds, based on the Board's data. Should a significant portion of this force come to bear on a child/infant's head or outstretched limb, the disastrous results are obvious.

This serious injury potential is not a whim of the technical imagination but a real possibility with some child restraint devices. This condition is of grave concern to the FAA, and although it was thoroughly discussed with the Board's staff, it was not addressed in the Board's recommendation.

Beyond the above two issues, the FAA wishes to make the record clear on other matters discussed by the Board in its recommendation. In numerous meetings and telephone conversations with NHTSA prior to issuance of TSO-C100, NHTSA did discuss preliminary plans to conduct a test program to illustrate why it was of the opinion that additional dynamic testing was unnecessary. At that time, the FAA explained its position, as outlined above, as to why it believed the tests proposed by NHTSA would be non-conclusive. The discussions with NHTSA occurred many months prior to the actual tests. The FAA was never invited to participate in the tests, nor did it have knowledge of NHTSA's decision to conduct the tests when TSO-C100 was signed. The statement by the Board that "the FAA declined and proceeded with the issuance of the final TSO" is not only incorrect, but that statement was discussed with the Board's staff prior to issuance of the recommendation and pointed out to be incorrect. We cannot understand why this statement remains.

In the Board's discussion, it is also stated that "... it is not certain that parents will be able to use already-purchased units of these models on aircraft, since they do not bear FAA's TSO label." Your staff was thoroughly briefed more than once on the fact that the FAA has always been committed to allowing the use, during all flight regimes, of non-TSO-approved child restraint devices of an identical make and model to a device that has received TSO or supplemental type certificate (STC) approval. Thus, in the

case of the Cosco-Peterson Model 78, those existing Model 78 devices which are identified by the required FMVSS 213 tag can presently be used on aircraft, since they are identical to the STC-approved Cosco-Peterson Model 78. The manufacturer estimates this to be several hundred thousand units. In the case of the second manufacturer, Century Products, who is actively seeking approval of four models and is very close to actual approval, there are over a million existing units. Thus, in the very near future, there will be an extremely large number of units in the hands of the public that can be used aboard aircraft. We have followed through with this expressed intent by working with the Air Transport Association (ATA) and the Regional Airline Association (RAA) to implement this policy as evidenced by the enclosed letters to the ATA and RAA. Both organizations have indicated a desire to make this information available to their member airlines and express a willingness to assume the responsibility at the airplane boarding gate to check for appropriate makes and models of child restraint devices brought on board. We believe this shows a positive commitment by the agency to maximize the availability of child restraint devices for the traveling public. Again, why has the Board chosen to ignore this information, and assert the opposite? The facts are that with FAA STC or TSO approvals which now (or will shortly) exist, manufacturers estimate that over a million restraints (5 different models) will be immediately available for passenger use.

The Board's staff was also advised by the FAA staff very recently that more than one airline has made the FAA aware of its desire to provide, in some manner, child restraint devices for those passengers with small children who wish to use them. One child restraint manufacturer has also been approached by several major airlines desiring to provide devices for children, and one general aviation manufacturer is pursuing the marketing of an approved device. It is our belief that the competitive nature of the airline industry and the desire on the industry's part for maximum child/infant safety will very shortly result in wide-spread use of child restraint devices on aircraft.

The FAA has always seen merit in working with NHTSA with the objective of developing one standard for devices to be used in aircraft and automobiles. For the record, there is now one standard available for both: TSO-C100. Prior to issuing TSO-C100, the agencies held very high level discussions directed toward that objective. In the end, though, the agencies were not able to agree, for aircraft and automobiles simply have different environments. Those differences in environment are what led to the four additional requirements in TSO-C100. These four requirements are: (1) a 20 mile per hour test in accordance with Figure 3 of FMVSS 213; (2) an inversion test of containment for conditions of in-flight turbulence; (3) tests or analyses to show compliance with the crash loads for transport airplanes as specified in 14 CFR 25.561; and (4) the requirement that any tests be conducted in a representative aircraft passenger seat, which is available for use free of charge from the FAA. We are told that the entire test procedure may be undergone for \$1,500 per restraint.

The preceding discussion, Mr. Chairman, has been directed at responding only to those aspects of the Board's recommendation which are central to the substantive issues at hand. I am obligated to advise you, however, of my profound shock and dismay at the inaccuracies and misrepresentations which appear throughout the Board's recommendation. While these are not, per se, substantive issues addressed by the Board, I am sure you will agree that they affect the context in which one reviews the substantive issues. Let me be specific:

o The discussion on page 1 of the recommendation concerning in-flight turbulence can only be characterized as a combination of hyperbole and hypocrisy. The laws of physics do not permit objects to "fly about the cabin" during in-flight turbulence such that they could become a "hazard" to crewmembers, and neither the recommendation nor any technical literature of which we are aware indicates that, considering in-flight turbulence alone, seat belts are insufficient. Lastly, we are hard pressed to reconcile the importance the Board places on in-flight turbulence in this discussion with its dismissal of the need to test designs for their ability to provide inflight turbulence protection which FMVSS 213 does not effect.

o The discussion of CAMI's testing of child restraint systems is embarrassingly misleading. While the CAMI scientists, in fact, are world respected pioneers in this field, the Board characterizes their 1975 tests as using "bean bags" and "arbitrarily" evaluating the device effectiveness, concluding with an assertion that CAMI scientists felt that a uniform test procedure must be established. No professional could read the CAMI report and truthfully come to such conclusions. Specifically, CAMI scientists over a period of several years developed (for NHTSA auto crash tests!) the sophisticated anthropomorphic infant and child dummies, and used them in these tests. In addition, the "arbitrary" evaluations and need for a uniform test procedures were factors CAMI thought significant about past tests, and did not in any way characterize their work. The Board's review of the CAMI study is, at best, inadequate and indicates that it did not properly take into account this important work, which is central to our analysis of the technical issues.

o The Board's discussion of factual matters relative to the Portland accident directly conflicts with its earlier (August 24, 1979) communication on this subject. According to the 1979 communication, there were 6 infants-in-arms (24 months or younger) and 6 children up to 8-years old on this flight, of whom two infants and a child were fatally injured. In 1979, the Board stated that there were no injuries to the remaining infants and small children, and the deaths were in a nonsurvivable section of the aircraft. Now, the Board maintains that "several unrestrained infants and a small child were killed and others were injured" in this accident. Has the casualty toll risen with time, based on new information, or is this another example of distortion?

o The Board's discussion of the 30 mph crash test throughout the recommendation shows a lack of understanding--or distortion--of the technical issues. One cannot hope to compare static test requirements to dynamic test requirements, as done here, and make a technically sound argument.

o While part of Calspan's conclusion was accurately quoted by the Board, taking the statement out of context--as was done--distorts the real meaning of their conclusion. If you assume, as Calspan did for the purposer of this NHTSA-sponsored effort, that the need for additional tests would be demonstrated by excessive head and/or chest accelerations and loads, theirs is an inescapable result. As we have discussed above, however, these are not the sole criteria by which competent technical people judge the performance of aircraft child restraints. Calspan's conclusion was limited to the interpretation of only one of a number of important pieces of performance data, and should not be interpreted as a blanket statement of their agreement with the technical posture adopted by either NHTSA or the Board.

Mr. Chairman, I believe these examples illustrate why I am concerned. It is my assumption that this is an aberrant instance, and one which will not be repeated in the future. As we have discussed, there is nothing more important to an interagency relationship--and service to the taxpayer--than mutual professional respect.

In summary the FAA does not agree with the basic premise stated by the Board for justifying Recommendation A-83-1. We believe that the issues raised by the Board in its discussion, and many related issues presented by its staff, have been thoroughly and openly discussed with the Board's staff, and the FAA's position has been clearly articulated. This information has not been accurately presented by the Board in this recommendation. The minimal added requirements of TSO-C100 are necessary for the safety of children and infants traveling on aircraft. Unless the Board provides us with substantive justifications as to why the requirements of TSO-C100 are unnecessary, we plan no further action on Recommendation A-83-1, and we request it be withdrawn.

NTSB LTR DTD: 9/28/83

The Safety Board has reviewed a Notice of Proposed Rulemaking published by the National Highway Traffic Safety Administration (NHTSA) in the Federal Register of August 15, 1983, proposing an amendment to Federal Motor Vehicle Safety Standard (FMVSS) 213: **Child Restraint Systems**. The amendment would incorporate, as an additional series of tests, the dynamic and static tests set forth in the FAA's Technical Standard Order (TSO) C-100. **Child** safety seat manufacturers who elect to submit their product to these additional tests would be able (if the product performs satisfactorily in the tests) to certify them for use in aircraft.

The notice also states that the Department of Transportation (DOT) arranged for the testing of all currently available **child** safety seats to determine which already meet the additional aviation use tests. We understand that all FMVSS approved seats (including booster seats) have now been tested and all have passed the additional tests. We urge that the FAA encourage manufacturers of seats successfully tested in the DOT program to apply for immediate TSO approval and that FAA approval be promptly granted, so that a maximum number of seats may be available for aviation use while the NHTSA rulemaking is pending.

The Safety Board continues to believe, as detailed in its letter to you of February 24, 1983, that a need has not been demonstrated for additional tests for aviation use, and that the tests do not ensure any greater effectiveness in air travel use than that already assured by FMVSS 213. We believe that the reported results of the recent DOT crash testing program support the Safety Board's conclusions in this respect.

The NHTSA proposal would eliminate many of the procedural complications inherent in the current regulatory arrangement, involving two Federal agencies with substantially different certification and compliance procedures. These procedural complications have had the effect of discouraging **child** safety seat manufacturers from seeking approval for aviation use of their products, thus denying infant and **child** air passengers the protections offered by safety seats. Because these significant procedural improvements and the positive results of the DOT testing program may encourage manufacturers to seek certification in both the motor vehicle and aviation modes, Safety Recommendation A-83-1 will be held in an "Open--Acceptable Alternate Action" status, pending adoption of a final rule amending FMVSS 213.

The Safety Board continues to be concerned about the extent to which the personnel of many major airlines appear to be uninformed or incorrectly informed that the FAA already has approved five infant and **child** safety seats for use on aircraft. Enclosed is a copy of a survey recently conducted by the American Academy of Pediatrics, which suggests that several airlines are unaware that they may permit the four approved Century models to be used on aircraft; that several are also unaware of the approval of the Cosco-Peterson model; and that several believe the seat must bear a FAA label before it can be permitted to be used. We have verified this continuing problem through inquiries by Safety Board personnel during recent air travel. We believe that this confusion may intensify during the several months before amendments to FMVSS 213 may become final. We urge you to take vigorous action to ensure that airlines and their personnel are informed about the correct status of all currently approved **child** safety seats and of others that may be approved during the next few months. We would appreciate learning of the steps the FAA takes in this regard.

FAA LTR DTD: 11/9/83

Your letter indicates the Board's support of the Department of Transportation's (DOT) proposal to amend Federal Motor Vehicle Safety Standard No. 213 to include optional performance standards to assure safe use of **child** restraint systems in aircraft. You asked the FAA to encourage manufacturers to

seek FAA approval of restraint devices that performed satisfactorily during recent tests at the Calspan Corporation. In addition, you requested the FAA to tell the Board of FAA action to ensure that airlines are informed of the FAA-approved child restraints.

The FAA cooperated fully with the National Highway Traffic Safety Administration (NHTSA) and supports the DOT Notice of Proposed Rulemaking (NPRM) that was finally issued on August 15, 1983. It is a DOT goal to have people frequently use restraint devices that are acceptable for use in both aircraft and motor vehicles. The FAA and NHTSA are working together to achieve that goal. Secretary Dole has made several announcements of this cooperative effort and the Department's program to test child restraints currently on the market.

All of the available child restraints tested by Calspan for the DOT have passed the additional tests outlined in the NPRM to assure proper performance in the aviation environment. The FAA has sent the first Calspan progress report of this testing to the manufacturers whose products were tested as indicated in the NPRM. Based on the performance of all child restraints at Calspan, the FAA is encouraging manufacturers to seek FAA approval of their products under Technical Standard Order C100 before the combined amended Standard 213 becomes effective.

In our letter of March 11 we indicated to the Board our efforts in working with the Air Transport Association and the Regional Airline Association to implement our policy on the use of child restraints. In addition to the press releases by Secretary Dole and direct contacts of airlines by the FAA's Office of Public Affairs, FAA Principal Operations Inspectors provide airlines with a FACT SHEET that lists FAA-approved child restraints; and it is updated as new child restraints are approved for use in aircraft. A notice will be published in the Federal Register of the FAA's intent to issue an advisory circular on the use of child restraints in aircraft. The advisory circular will provide airlines and the general public with procedures to assure the safe use of DOT-approved seats in aircraft.

We believe the above to be fully responsive to your concerns and plan no further action.

NTSB LTR DTD: 5/29/84

The Safety Board has reviewed the FAA's letter of November 9, 1983, discussing the status of several matters related to the use of child restraint devices in aircraft. The letter indicated that the FAA believes the actions outlined in the letter are fully responsive to the Safety Board's recommendation and that your agency plans no further action.

We are concerned about the length of time involved in Technical Standard Order (TSO) approval of child restraint devices. Each type of child restraint device currently available in the United States was tested last summer by the Calspan Corporation using criteria considered by your agency to be appropriate for aircraft use. All the devices passed those tests, many with wide margins of safety. According to the National Highway Traffic Safety Administration, approximately 9.2 million infant/child safety seats have been produced since January 1981 and are in use today. Only about 36 percent of these seats have been approved by the FAA for use in aircraft. Eight percent of them display a TSO label; another 28 percent are FAA-approved but are not labeled, thus making it less likely that parents will be permitted by the airlines to use them. We believe that the TSO approval process should be expedited by the FAA given the fact that all devices have met the FAA's test requirements.

The Safety Board reiterates its concern that confusion continues to exist on the part of airline personnel concerning the approved use of child restraint devices. Despite FAA letters to the Air Transport Association and the Regional Airline Association, we continue to hear of real-world examples in which

airline personnel are prohibiting the use of approved devices. The Board requests that the FAA increase its efforts to ensure that all airlines have properly instructed their personnel in this matter and that they continue to update their guidance as additional devices are approved by your agency.

The Safety Board shares with the FAA and the Department of Transportation as a whole the goal to have people frequently use restraint devices that are acceptable for use in both aircraft and motor vehicles. We urge accelerated TSO approval of these devices pending issuance of amendments to FMVSS 213 and the expeditious dissemination to all airlines of information concerning their approval.

Safety Recommendation A-83-1 will be held in an "Open--Acceptable Alternate Action" status as stated in our letter of September 28, 1983, pending the adoption by the National Highway Traffic Safety Administration of a final rule amending FMVSS 213 to provide a common standard for restraint devices for aircraft and motor vehicles.

The Safety Board would appreciate being advised of the actions you take regarding the matters discussed above.

FAA LTR DTD: 2/25/85

The FAA is "amending" Technical Standard Order (TSO) C100 to permit the use of child/infant restraint devices labeled in conformance to 49 CFR 571.213, §5.5.2(e) effective January 1, 1981, and labeled in conformance to 49 CFR 571.213, §5.5.2(e) and (m) (effective February 26, 1985). Since amended Federal Motor Vehicle Safety Standard (FMVSS) No. 213 was published in the Federal Register (49 FR 34357; August 30, 1984) and becomes effective February 26 1985, child restraint manufacturers will now have a single mandatory regulation for the certification of their child restraint devices for use in both motor vehicles and aircraft. The FAA is proposing that TSO-C100 be withdrawn, thus removing any remaining confusion over the proper child restraint approval standard.

The FAA's November 9, 1983, letter to the Board indicates that a notice of intent to issue an advisory circular (AC) would be published in the Federal Register. That notice was published in the Federal Register (14 FR 12797) on March 30, 1984, and the FAA has the Board's comments on the draft AC concerning the use of child restraints in aircraft. The FAA continues to believe that its action is fully responsive to the Board's concern, and the final AC should be issued as originally planned. The AC will be revised to address the new amended FMVSS No. 213 and the agency's finding that all safety seats manufactured between January 1981 and February 1985 are acceptable for use in aircraft. All airlines will be strongly encouraged to allow safety seats conforming to FMVSS No. 213 that was effective between January 1, 1981, and February 26, 1985. We consider action on this recommendation completed.

NTSB LTR DTD: 7/1/85

The Safety Board is pleased to learn that the FAA has cooperated with the National Highway Traffic Safety Administration in the promulgation of changes to Federal Motor Vehicle Standard (FMVSS) 213 which will accommodate the safety requirements pertinent to the use of child restraints in aircraft and result in a single Federal standard. The consequent withdrawal of TSO C-100 eliminates the previous confusion resulting from multiple standards and permits the use, in airplanes, of infant/child safety restraints that conform to FMVSS 213. The FAA's actions comply with the intent of this Safety

Recommendation; therefore, Safety Recommendation A-83-1 has been classified as "Closed--Acceptable Action."

Your efforts to respond to our Safety Recommendations are appreciated.



NTSB Recommendations to FAA and FAA Responses Report

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Rprt_Nbr: A-95-51

Last Updated: 04-11-96

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On July 2, 1994, a Douglas DC-9-31, N954VJ, operated by USAir, Inc., as Flight 1016 collided with trees and a private residence near Charlotte/Douglas International Airport, Charlotte, North Carolina, shortly after the flightcrew executed a missed approach from the instrument landing system (ILS) approach to runway 18R. The captain, first officer, one flight attendant, and one passenger received minor injuries. Two flight attendants and 14 passengers sustained serious injuries. The remaining 37 passengers received fatal injuries. The airplane was destroyed by impact forces and a postcrash fire. Instrument meteorological conditions prevailed at the time of the accident, and an instrument flight rules flight plan had been filed. Flight 1016 was being conducted under 14 CFR Part 121 as a regularly scheduled passenger flight from Columbia, South Carolina, to Charlotte.

Recommendations:

A-95-51. Revise 14 Code of Federal Regulations Parts 91, 135, and 121 to require that all occupants be restrained during takeoff, landing, and turbulent conditions, and that all infants and small children be restrained in a manner appropriate to their size.

Responses:

FAA LTR DTD: 6/7/95

I am writing in response to Safety Recommendation A-95-51 to urge the National Transportation Safety Board to reconsider this recommendation which calls for a Federal rule mandating the use of child safety seats in general aviation and commercial aircraft. The Board has asked that all infants and small children be restrained in a manner appropriate to their size. The Board's letter indicated that this rule should apply to children up to 2 years of age. We share with you a strong commitment to children traveling in the safest transportation system, but studies cause us to reach a different conclusion from the Board on this issue.

Today the Federal Aviation Administration (FAA) is releasing a report to Congress on child restraint systems (CRS). I have enclosed a copy of this report for the Board's information. The report contains several conclusions which address the issue of mandatory use of CRS's.

A Federal rule mandating the use of effective CRS's would prevent a maximum of five infant air accident fatalities over the next 10 years.

If CRS's are mandated, the average additional costs would be about \$200 per family trip. Several air carriers indicated in the panel discussions conducted as part of this report that their current policy is to charge families traveling with infants the full airfare if seats are reserved for infants (except during promotional periods). The total estimated cost of this mandate for families over a 10-year period would be nearly \$1 billion.

If families traveling with infants are charged full airfare, 27 percent would continue traveling by air, 53

percent would forego the trip, and 20 percent would divert to other modes. This shift to other transportation modes would result in a net increase of 82 infant and adult fatalities over 10 years.

Even if air carriers charge only 25 percent of full fares, diversion would still occur and would result in a net increase of 17 infant and adult fatalities over 10 years.

Since a Federal mandate could cause more deaths and injuries than it would prevent, the FAA is committed to the development of nonregulatory methods to achieve the goal of securing children in the appropriate restraint devices in aircraft. On this issue the FAA, the Board, and the industry need to educate--not to regulate. To this end the FAA is developing a nationwide public education campaign to promote the use of child restraints and to advocate programs that help achieve the mutual goal of enhancing the safety of infants and small children. In concert with the FAA's education initiatives, the Secretary of Transportation is writing to the chief operating officer of each of the major airlines urging the individual airlines to develop low cost programs that encourage parents to secure children under 2 years of age in CRS's. I have enclosed a draft copy of the Secretary's letter for the Board's information.

The FAA has also undertaken several activities which will enhance the level of protection provided by CRS's in aircraft. The first initiative is the notice of proposed rulemaking (NPRM) that was published in the Federal Register proposing to prohibit the use of booster seats and harness and vest child restraint devices for use in aircraft. I have enclosed a copy of the NPRM for the Board's information. The NPRM was based on the results of a September 1994 study by the FAA Civil Aeromedical Institute (CAMI) which evaluated the performance of CRS's in a dynamic test program. Concurrently, the National Highway Traffic Safety Administration (NHTSA), which has regulatory authority for the design of CRS's, published a companion NPRM proposing to prohibit the labeling of booster seats and harness and vest child restraints as approved for use in aircraft.

Another initiative involves ongoing CAMI tests to identify methods for improving the performance of front-facing seats for infants and small children. The FAA continues to recommend the use of rear-facing seats for children under 20 pounds. A child over 40 pounds may safely use the aircraft seat belt and does not require a CRS. The FAA recommends forward-facing seats for children between 20 and 40 pounds. While these seats are currently the best and safest alternative for children in this weight range, the CAMI study indicates that further enhancements are required to improve the safety performance of some forward-facing devices.

Finally, the FAA and NHTSA are working together to revise NHTSA's Federal Motor Vehicle Safety Standard 213 and to develop new standards for the certification of CRS's. The objective is to update the standard to take into account differences in the designs of automobile seats and aircraft seats and to lead to the development of fully intermodel CRS's. The FAA anticipates that most of these initiatives will be completed by the end of 1995.

The FAA takes every recommendation from the Board seriously as evidenced by the high acceptance rate of past recommendations. On this particular issue the FAA, as well as the Secretary of Transportation and NHTSA, has undertaken major initiatives to address the safety of infants and small children in aircraft. When there is a divergence between our organizations on the proper course of action as in this issue, it is critical to share our supporting facts and analysis so that we can reach a mutually acceptable solution. I am confident that we can do so in the area of child restraints. To this end my senior staff will contact your office to arrange a briefing of the Board Members and staff to discuss ongoing initiatives and the issue of CRS's. Meanwhile, I request that the Board reconsider its request for regulatory action to mandate the use of CRS's in favor of the nonregulatory program that I have outlined in this letter.

NTSB LTR DTD: 10/20/95

The Safety Board notes that the FAA shares the Board's strong commitment to the safety of children traveling in aircraft. However, based on studies cited by the FAA in its letter, the FAA has urged the Safety Board to reconsider its recommendation for regulatory action to mandate the use of child restraints in favor of nonregulatory measures.

On June 7, 1995, the FAA released a two-volume report to Congress entitled "Child Restraint Systems" (CRS). The Safety Board recognizes that the FAA expended considerable time and resources to develop this report, which concluded that mandating CRS on air carrier flights could result in some passenger diversions to automobiles, resulting in a net decrease in safety.

The scenarios proposed by the FAA that result in passenger diversions to automobiles and a net safety reduction are based on the premise that substantially higher air fares for families traveling with children will create those diversions. These diversions are based on the FAA's elasticity estimates that characterize families traveling with children as being highly price sensitive.

Given the FAA's assumed price sensitivity for these travelers, the Safety Board believes that if airlines were to charge a substantial fare for infants who currently are traveling free, the initial reduction in air travel by families would result in a substantial revenue loss for airlines, causing them to incur the FAA study's revenue loss estimate of up to \$6 billion over a 10-year period. However, the Safety Board is certain that the airlines will not let \$6 billion worth of price-sensitive travelers shift to the automobile without a competitive response. Airlines could offer any number of innovations to keep the families flying, such as free seats for infants or group discounts. The FAA study recognizes this likelihood in a passage that states, "Air carriers are expected to charge for infants only with the possibility of minimal passenger diversions and no net loss of revenues. Those charges would occur during peak travel seasons (when the report predicts families are least likely to switch to automobiles) and peak periods of the day. (Families) may be offered significant infant fare discounts or free infant passage during off-peak periods." (p. 7-1)

In testimony before the U.S. House of Representatives on July 20, 1990, the Vice President of Operations for the Air Transport Association stated that with regard to potential passenger diversion to automobiles, air carriers "rather than risk the loss of one or more adult fares or perhaps an entire family unit, will offer a fare arrangement acceptable even for families traveling with infants who previously would have flown free."

The airlines are likely to permanently impose higher fares for infants only if they discover that the families traveling with infants are less price sensitive in practice than anticipated by the FAA. In that event, again, there would be limited diversion of passengers to automobiles and the added risk of automobile accidents.

The Safety Board notes that the FAA study selected what it labeled "Scenario Number 411 as the CRS option that prevented the most injuries and fatalities, with the least economic impact to air carriers. The study describes this scenario as one in which a family could reserve a seat for an infant traveler on a space-available basis, providing their own CRS. The Safety Board observes that this scenario is functionally identical to the current situation, in which airlines permit families to secure CRS on empty seats, when available. Thus, Scenario 4 would result in no net safety improvement.

Consequently, the Safety Board believes that the FAA's projected costs to air travelers, revenue losses to airlines, and passenger diversions to automobiles as a result of mandated CRS for infants are based upon incomplete analysis.

The Safety Board also notes the FAA's intention to develop a nationwide public education campaign to promote the use of **child** restraints. The Board believes that this campaign is appropriate. The Safety Board does not, however, believe that education alone will result in the protection of infants and small children on airplanes. Education alone did not result in high usage of CRS in automobiles; consequently, all 50 States and the District of Columbia now have mandatory automobile **child** restraint laws. The Safety Board is pleased to learn that Secretary Pena has written to air carriers asking that they establish incentives that encourage parents to fly with properly restrained children; the discount fares offered by Southwest Airlines to children who use CRS are consistent with such efforts.

The Safety Board and its staff look forward to a briefing by your senior staff to discuss the issue of CRS. Please have your staff contact Mr. Ronald Schleede, Acting Deputy Director, Office of Aviation Safety, at (202) 382-6610 to schedule the briefing.

Pending the meeting of our staff to discuss this issue, Safety Recommendation A-95-51 will remain classified "Open--Unacceptable Response."



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Copyright 1997 Chicago Sun-Times, Inc.
Chicago Sun-Times

July 6, 1997, SUNDAY, Late Sports Final Edition

SECTION: EDITORIAL; Pg. 23

LENGTH: 233 words

HEADLINE: Good news for fliers

BYLINE: EDITORIALS

BODY:

In the midst of the travel season comes good news for families who fly: American has instituted half-price tickets for children 2 and under, and United has ended automatic early boarding.

At American, officials are attempting to stop parents from holding infants on their laps while in flight. Though federal law allows this, it is a potentially dangerous practice for the estimated 2 million "lap babies" who take to the air each year. Earlier this year, a bill was introduced in the U.S. House to require all passengers to have seats. That makes sense. Laptop computers, beverage carts and purses are required to be secured but infants are not, meaning they become missiles in a mishap.

At United, the end of automatic early boarding may seem, at first blush, to be anything but welcome. Any traveler knows, however, what early boarding has come to mean: half of the passengers seem to think they qualify. A practice designed to give parents a little extra time to properly **seat their children** has become a rush of boors.

Now, United says, those seeking early boarding must ask at the gate before the scheduled takeoff. The **airline** promises it will be generous in accommodating families. We hope United stays true to its word. Early boarding has as much to do with ensuring an orderly flow of boarding for childless passengers as it does with helping a family get the kids seated.

LANGUAGE: English

LOAD-DATE: July 7, 1997



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American Leads Offers To Cut Toddler Air Fares

DOCUMENT 1 OF 1

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American Leads Offers

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173 Words

1597 Characters

07/03/97

The Wall Street Journal

A6

(Copyright (c) 1997, Dow Jones & Company, Inc.)

FORT WORTH, Texas -- AMR Corp.'s American Airlines said it is offering a 50% fare discount for children under two years of age in a bid to encourage the increased use of child-safety seats on planes.

Minneapolis-based Northwest Airlines Inc., Houston-based Continental Airlines and Atlanta-based Delta Air Lines Inc. all said that they would match the offer, which American said would apply to most published adult fares, including deeply discounted excursion fares.

American said that adult passengers can continue to hold infants under two on their laps, as is permitted by federal law, without buying a ticket for them.

Whether consumers will rush to take advantage of the offer is uncertain.

The National Transportation Safety Board and others have called for the mandatory use of toddler restraints on commercial aircraft. But in a 1995 report, the Federal Aviation Administration said that if adults are required to purchase tickets for their infants, more of them are likely to shift to other modes of transportation, such as automobiles, and fatalities could increase as a result.

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Copyright 1997 Chicago Sun-Times, Inc.
Chicago Sun-Times

July 3, 1997, THURSDAY, Late Sports Final Edition

SECTION: NWS; Pg. 1

LENGTH: 390 words

HEADLINE: Babies to get airfare break

BYLINE: BY MARY ELLEN PODMOLIK

BODY:

American Airlines upstaged its competitors Wednesday, becoming the first **airline** to permanently cut ticket prices in half for **children** under age 2.

The nation's second-largest **airline** said it wanted to encourage parents to buy **seats** for infants and toddlers, rather than hold them on their laps and pay nothing. The 50 percent discount will be based on the fare of an adult accompanying the child, and apply to all U.S. domestic and U.S.-Canadian flights on American and American Eagle.

Military, senior citizen and government fares, which already are discounted, are ineligible for the discount.

The Association of Flight Attendants estimated that 10,000 children under age 2 sit in adults' laps daily. Federal rules require **children** over age 2 to have their own **seats**.

"We believe our 50 percent infant fare makes economic sense, both for parents and the **airline**," American spokeswoman Mary Frances Fagan said. "It's an affordable way to safely keep infants in their seat. We wanted to be first."

United Airlines and United Express, Delta Air Lines and Northwest Airlines said they would match American's new policy. Other airlines said they were studying the matter.

Until Wednesday, only Southwest Airlines offered a one-way discount fare of no more than \$ 129 for children under age 2.

"I think it's a great step forward," said Heather Paul, executive director of the National Safe Kids Campaign. "It probably gives parents the overriding message that **children** need to be restrained whenever they're moving."

Airlines had resisted calls for them to discount **seats** for small **children**. A **seat** is a **seat**, **airlines** reasoned, whether a child or adult sits in it.

"It's an issue the whole industry has been grappling with for a while," said Joe Hopkins, a spokesman at United **Airlines**.



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With about 70 percent of seats filled with passengers, airlines are flying high and can afford a benevolent gesture. But the industry also is under increased scrutiny on the issue.

In December, the Federal Aviation Administration began an advertising campaign urging travelers to use safety belts for themselves and their children when flying.

Earlier this year, a White House committee suggested not allowing children under the age of 2 to fly while sitting on adult's laps.

Passengers must supply their own child safety seats.

LANGUAGE: English

LOAD-DATE: July 3, 1997



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Copyright 1997 The New York Times Company
The New York Times

July 3, 1997, Thursday, Late Edition - Final

SECTION: Section A; Page 16; Column 1; National Desk

LENGTH: 500 words

HEADLINE: Airlines Start 50% Discount for Those Under 2

BYLINE: By ADAM BRYANT

BODY:

American Airlines said yesterday that it would permanently offer a 50 percent discount on fares for children under 2 years old, a move that was quickly matched by many airlines, including United, Delta, Northwest and Continental.

The discount, which is only for flights within North America, offers a new choice for parents who regularly grapple with the decision of whether to pay a full extra fare for a seat for their infants. Many parents do not buy a ticket and hope that empty seats are available on their flight. If not, they have to hold the babies in their laps.

A Federal Aviation Administration regulation allows this for children under 2, though some safety experts have questioned the wisdom of the rule. In February, for example, a commission on aviation safety led by Vice President Al Gore recommended eliminating the waiver that allows infants to fly without being restrained in their own seat.

But the aviation agency has determined that requiring parents to buy a seat for every child might make air travel too expensive for many families, and that they would instead travel by automobile, which statistically would make them be more likely to be injured or die in a car crash.

The F.A.A., which started an advertising campaign last December to encourage parents to restrain their **children** in a safety **seat**, said it "applauds American **Airlines'** move to enhance aviation safety for young travelers."

Parents must supply their own infant safety seat. Most car seats for babies are approved by the Government for use in cars and airplanes.

According to a 1995 report to Congress by the aviation agency, nine infants died in plane crashes on United States airlines from 1978 to 1994. In that period, four infants suffered major injuries in plane accidents and another eight suffered minor injuries.

Like many other **airlines**, American often reserves the seat next to a parent who does not buy a ticket for an infant. But on heavily booked flights, those **seats** are not guaranteed.

Airlines have for some time offered a variety of discount fares for



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children on international flights.

Airlines generally use sophisticated computer software to gauge whether a new fare is likely to generate revenue, or possibly lose money by displacing passengers paying full prices. At the very least, said Kevin C. Murphy, an industry analyst at Morgan Stanley, "the airlines probably want to look like they are acting in the interest of public service, and the goodwill never hurts."

Robert W. Baker, American's executive vice president for operations, said at a news conference that the airline expected a modest increase in revenue as a result of the new fare.

Although a child safety seat clearly offers better protection in a crash, they also reduce the risk of injuries when planes encounter turbulence. The F.A.A. said that about 60 passengers of all ages are injured every year because they were not wearing a seat belt when flying through turbulence.

LANGUAGE: ENGLISH

LOAD-DATE: July 3, 1997



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Copyright 1997 Gannett Company, Inc.
USA TODAY

July 3, 1997, Thursday, FINAL EDITION

SECTION: NEWS; Pg. 1A

LENGTH: 346 words

HEADLINE: 7 airlines halve fares for infants

BYLINE: Donna Rosato

BODY:

Seven **airlines** will sell half-price fares for **children 2** and under, giving parents an incentive to buy separate **seats** for **children** rather than holding onto them in flight.

"**Children** are much safer in safety **seats**," said American **Airlines** executive vice president Bob Baker, whose **airline** was first to announce infant fares Wednesday.

United, Delta, Continental, Northwest, TWA and Canadian **Airlines** International will match the fares. Southwest Airlines already sells infant fares.

American said it's likely to gain revenue. Two million children 2 and under fly annually.

Coming at the start of the summer vacation season, the move revives an eight-year-old debate about whether small children are safe riding planes seated on adults' laps.

Airlines now let fliers hold toddlers on their laps or use an empty **seat**. But flights are 70% full on average and many are sold out. Less than 5% of **children 2** and under have separate **seats** bought for them.

The Federal Aviation Administration has hesitated to order separate **seats**, fearing that more families would drive instead of fly. Such a rule could result in more child deaths than it would save because flying is safer than driving.

From 1978-94, nine children under 2 died in plane accidents. Five would have lived if they had been in child seats, the FAA says.

During the same period, four infants suffered major injuries and eight had minor injuries. Ten of those injuries might have been prevented if child seats were used.

The infant fare is good on all domestic and U.S.-Canada flights and all published fares.



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People flying on a free frequent-flier ticket can get an infant discount at the lowest fare available on the day they buy the ticket. Those who buy the infant discounts must provide their own child safety seats.

"American has opened the door. I'd like to see less restrictions and steeper discounts," says Rep. Peter DeFazio, D.-Ore., who sponsored a bill in March that would require child safety seats. A similar bill is pending in the Senate.

LANGUAGE: ENGLISH

LOAD-DATE: July 03, 1997



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July 03, 1997, Thursday, Final Edition
Correction Appended

SECTION: A SECTION; Pg. A01

LENGTH: 757 words

HEADLINE: Airlines Offer Fare Cuts for Infant Seats; Discounts Aimed at Ensuring Child Safety

BYLINE: Don Phillips, Washington Post Staff Writer

BODY:

American **Airlines** Inc. yesterday offered 50 percent fare discounts for **children** under 2 who occupy approved child safety **seats** instead of sitting on their parents' laps. Other major **airlines** matched the plan.

Robert W. Baker, American's executive vice president for operations, said **children** under 2 can still fly free as "lap babies," and parents can still place child safety **seats** in any empty seat for free. But the new fare is the only way to guarantee a seat on crowded flights and ensure a level of safety that cannot be matched on an adult's lap.

Baker appeared at a news conference with a row of airline seats. One was fitted with a child safety seat containing 9-month-old Nicholas Strother, who was seated beside his mother, Daniella, an employee of American's government affairs office. Nicholas was active but content through much of the news conference, but then began to express his displeasure.

Jim Hall, chairman of the National Transportation Safety Board, called American's move "a courageous act," and noted many reports of accidents in which children in safety seats lived while lap babies died. The board has recommended repeatedly that the FAA require all babies to occupy a child safety seat.

Hall noted that everything on an airliner must be belted in or locked down during takeoff, landing and turbulence, meaning that babies "are the only thing . . . that is not secured."

Kathy Lord-Jones, an official with the Association of Professional Flight Attendants, appeared at the news conference with Baker. The APFA, which represents American's flight attendants, and the larger Association of Flight Attendants have long called for actions -- either from the Federal Aviation Administration or the **airlines** -- that would ensure babies were in safety **seats**.

Under FAA rules, **children** up to 2 can fly free if they do not occupy a **seat**.

The FAA has repeatedly refused to require that babies be in safety seats,



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partly because that would increase the cost of flying and divert some families to automobiles. However, the FAA encourages the use of child safety seats and requires **airlines** to allow their use if the parent pays for a ticket.

The issue first appeared with the crash of a United Airlines DC-8 in Portland, Ore., on Dec. 28, 1978, when the safety board said one child's death could have been prevented by a safety seat.

Another United crash, in Sioux City, Iowa, on July 19, 1989, sparked a campaign by the board and the flight attendants' unions. Two infants were ripped from their mothers' arms when Flight 232 crash-landed and broke apart. One was later found dead. The other survived only after she was heard crying under debris.

United flight attendant Jan Murray, confronted in a cornfield by the dead child's mother, became an activist in a push for FAA and airline action. She told The Washington Post in 1992, "I can't think of a better gift to give your child [than a safety seat]. We spend a lot on them at Christmas, but their safety is more important."

In more recent years, Richard DeMary, a flight attendant who rescued several passengers from USAir Flight 1016 in Charlotte on July 2, 1994, told of pulling a woman from the burning wreckage. She was shouting, "Help me. I don't want to die. I can't find my baby." DeMary said he later learned that her 9-month old was thrown from her arms and flew over three rows of seats, dying from massive trauma.

Under American's plan, the child's fare generally would be half the adult fare, including discounted excursion fares.

Military, senior citizen and government fares would be excluded from the discount plan.

Asked why American did not simply provide free seats for babies, Baker noted that American is a business that still must make a profit, and that it is not too much to ask parents to pay half the cost of extra safety for their babies.

United Airlines, Delta Air Lines Inc. and Northwest Airlines Inc. immediately announced they would match American. Other airlines said they were studying American's plan.

Southwest Airlines Co. already has a child fare. "This is nothing new to us," said spokesman Ed Stewart. "It's nice to see them following our lead once again."

However, the Southwest policy is somewhat more complicated -- as much as 7 percent off the cheapest excursion fare, but the ticket can be purchased up to the last minute. And Southwest discourages parents from seeking a free empty seat by refusing outright to allow them to do so after reservations reach a certain level.

CORRECTION-DATE: July 4 1997

CORRECTION:

An article yesterday on airline fare cuts for infants using child safety



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The Washington Post, July 03, 1997

seats incorrectly identified the United Airlines flight attendant in the July 19, 1989, Sioux City crash who became an activist on child safety seats. She is Jan Brown-Loehr.

LANGUAGE: ENGLISH

LOAD-DATE: July 03, 1997

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Copyright 1997 The Christian Science Publishing Society
The Christian Science Monitor

March 21, 1997, Friday

SECTION: UNITED STATES; Pg. 1

LENGTH: 972 words

HEADLINE: Child Safety Vs. Higher Cost of Travel

BYLINE: Faye Bowers, Staff writer of The Christian Science Monitor

DATELINE: BOSTON

HIGHLIGHT:
HARD CHOICES

BODY:

On the roads or in the skies, few would disagree that infants are America's most precious cargo. Even parents who don't buckle up often insist that their children do. And for families with toddlers today, auto safety seats are standard equipment.

After nearly every accident involving a child, questions arise about safety requirements - as federal hearings this week into air bags show. The hearings are part of an unusual, albeit disparate, push now under way to retool the nation's child safety laws covering automobiles, bicycles, and commercial airlines.

"Adults are required to wear seat belts, luggage must be stowed, and even coffee pots must be restrained during take-off, landing, and turbulence," said Rep. Peter DeFazio (D) of Oregon, when he introduced a bill this month to require commercial aircraft to have safety seats for children under the age of 2. "Our infants should be afforded the same level of safety."

But enacting tougher standards is often hard. While no industry or government official wants to be perceived as uncaring, nearly two decades of debate over airplane child safety seats, for example, reflect the difficulty of mandating safety while keeping the cost of travel accessible to a wide audience.

Currently, **children** under 2 may be held during flights, eliminating the need for parents to purchase an extra **seat** (**airlines** call them unticketed lap **children**).

But momentum may finally be building for a change. The National Transportation Safety Board - a government watchdog agency - has long recommended that aircraft restraint systems for toddlers be mandatory. Vice President Al Gore's Commission on Airline Safety and Security recently seconded that call.

The Federal Aviation Administration, which is charged with regulating as well as promoting air travel, is currently reviewing the recommendation. But the FAA has declined to mandate the systems in the past because it says the benefits gained from child safety **seats** don't outweigh the cost to **airlines** and ultimately the



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passengers.

INDEED, travelers with **children** under the age of 2 would have to purchase another ticket if safety **seats** are required. That might force some people to forsake travel by air.

For example, Debbie and John Manchester, who have a 16-month-old son, say the increased cost would likely change their mode of travel. The Manchesters flew from their home in Madison, Wis., to Boston for Christmas. They did not have to purchase a seat for their son. "That would have cost us another \$ 200," Mrs. Manchester says. "We probably would have taken our car if we would have had to buy another ticket."

The FAA says that is the very reason it has declined to mandate child safety seats.

The back-and-forth between the government agencies over the safety seats also shows the different and often adversarial roles the NTSB and FAA play.

"The NTSB has the luxury of making recommendations without considering as broad a range of issues as the FAA has to," says Clint Oster, a business professor at Indiana University, Bloomington.

The NTSB typically investigates crashes, determines the cause, and recommends steps for the FAA to take to improve airline safety. The FAA must then perform a cost-benefit analysis for the industry.

The NTSB first recommended that the FAA require child restraint systems in 1979, then again in 1990 and 1994. The latest recommendation was issued after a nine-month-old infant was killed in a 1994 plane crash near Charlotte, N.C. The mother, who survived the accident, was unable to hold onto the child during impact.

The FAA responded to the NTSB recommendations by commissioning a study to research the "efficacy of child restraint systems." The study found that between 1978 and 1994, nine **children** under 2 were killed in **airline** accidents, and that five of those deaths could have been prevented by the use of child safety **seats**.

Like similar studies of child safety seats in autos, this study found the aft-facing types worked the best.

But the study found the potential increase in family travel costs, which would include the purchase of an additional seat for the infant, would force many families (like the Manchesters) to choose an alternative method of travel - mainly auto.

Moreover, the study said that since accident and fatality rates are significantly higher for automobile travel, that this would result in even more deaths.

"Once you work out all the numbers, requiring child safety seats would kill more people than they would save," says Dr. Oster.



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But the NTSB disagrees. It argues that the FAA's data are faulty - that **airlines** might, for example, offer reduced rates for that extra seat - particularly if a family travels on off-peak times.

As Congress takes up the bill mandating **airline safety seats** for **children**, similar cost-and-benefit discussions are under way in the debates over air bags and bicycle safety.

In the case of automobile air bags, the government has already mandated all new autos to be equipped with air bags. But the same government watchdog agency - the NTSB - is reassessing the technology.

Four days of hearings this week have included recommendations that manufacturers include switches so air bags can be deactivated by car owners and that parents should be educated to place child seats in the back seat facing aft. Last Friday, the government told automakers they may now install less powerful air bags in new vehicles.

Meanwhile, a growing number of cities and states are requiring bike riders under age 12 to wear helmets. Currently, 15 states and another 35 cities and counties elsewhere are mandating helmets for children.

GRAPHIC: PHOTO: GOING PLACES: Shahrokh Ghodrat and his daughter Darya wait for their flight at Boston's Logan Airport. Child safety seats could become mandatory on airplanes soon. R. NORMAN MATHENY - STAFF

LANGUAGE: ENGLISH

LOAD-DATE: March 20, 1997



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LEVEL 1 - 81 OF 112 STORIES

The Associated Press

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March 6, 1997, Thursday, PM cycle

SECTION: Business News

LENGTH: 444 words

HEADLINE: Lawmakers want small children strapped in on airplanes

BYLINE: By MELISSA B. ROBINSON, Associated Press Writer

DATELINE: WASHINGTON

BODY:

Last summer, David Tourtellotte fought with his wife over buying a \$ 200 airplane ticket so their 15-month-old daughter, Emma, would be sure to ride in a safety seat.

He's glad he bought it. The engine of Delta flight 1288 exploded in Pensacola, Fla., killing two people sitting in front of them.

"That seat saved her life," said Tourtellotte, of Clifton, Va., who spoke on Capitol Hill Wednesday in favor of legislation requiring that **children** under 2 ride in safety **seats** on airplanes.

The requirement would force parents to buy **seats** for their small **children**. Now, many **airlines** let parents use empty **seats** so their **children** can be buckled in. On full flights, though, small **children** often end up on laps.

"A child on a parent's lap will likely break free from the adult's arms as a plane takes emergency action or encounters extreme turbulence," said Sen. Patty Murray, D-Wash., who introduced the bill in the Senate.

Each year, 58 airline passengers in the United States are injured by turbulence while not wearing their seat belts, the FAA said.

"The benefits far, far outweigh the costs of protecting vulnerable infants," said Rep. Christopher Shays, R-Conn., who is sponsoring the House bill with Rep. Peter DeFazio, D-Ore.

The bill would not require **airlines** to install safety seats. Parents could supply seats that had been approved for airplane use, DeFazio said.

The Federal Aviation Administration, which regulates air travel, does not require the use of safety **seats** for small **children**, although it has encouraged their use through a public education campaign launched in December.



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The Associated Press, March 6, 1997

FAA officials, and the **airline** industry, cite a commissioned study that concluded a seat requirement would increase fatalities because more people would opt to travel by car. DeFazio said that study is faulty because it did not include actual surveys of airline passengers or parents.

"We certainly feel that strapping in a child is proper," said David A. Fuscus, spokesman for the Air Transport Association of America, which represents 22 U.S. airlines. "The question is what works and what doesn't."

One problem with a requirement is there are currently no standards for airplane safety seats, Fuscus said. The issue should be tackled by the FAA, not Congress, he added.

Asked how some families could afford the extra ticket cost, supporters said the impact would be small because most families have only one, or at most two, children under two.

Also, airlines could be expected to compete for passengers by offering discounted tickets for small children, especially during summer vacation months, they said. The bill requires no such discounts.

LANGUAGE: ENGLISH

LOAD-DATE: March 6, 1997



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March 2, 1997, SUNDAY, Late Sports Final Edition

SECTION: TRA; TAKING THE KIDS; Pg. 5

LENGTH: 873 words

HEADLINE: Make effort to keep children safe in the air

BYLINE: BY EILEEN OGINTZ

BODY:

The kids had fallen asleep, exhausted from too much vacation. The flight attendant poured me a surprisingly fresh cup of coffee. I'd just gotten into my new mystery when we hit the bumpy air.

Hot coffee splattered all over my book and me. The kids' markers rolled off the tray tables. The kids woke up with a start. You can guess what the rest of that flight was like.

"We're not going to crash, are we?" asked 10-year-old Reggie.

"I feel sick," moaned 5-year-old Melanie, who was in no mood to tighten her seat belt.

This time, we were lucky. The turbulence didn't last long and we were fine, save for a purple marker gone forever and a mom who hasn't yet finished that book.

But others aren't so fortunate. The Federal Aviation Administration reports 58 passengers not wearing their seat belts are injured each year by turbulence while flying in the United States.

Last December, in a widely publicized case, 16 passengers on an American Airlines jet -- including a 7-month-old infant -- were hurt when their flight ran into clear-air turbulence over Colorado.

FAA officials explain that turbulence often occurs unexpectedly, caused by air movement related to storms, cold and warm fronts or other atmospheric conditions. It can happen when the sky appears clear.

That's why it's essential to remain buckled throughout a flight, just as you would in a car. It's just as important to keep children restrained, especially young ones.

"A plane could drop a couple of thousand feet," said Jane Goodman, spokeswoman for the 40,000-member Association of Flight Attendants. "And when you hit a bump, the baby is going to go flying, head first."



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Even the most vigilant parent would be hard-pressed to hang on to the baby in her lap or the toddler in the next seat who has made a game of unbuckling his seat belt each time his dad buckles it.

"The point is the injuries caused by turbulence are completely preventable," said FAA spokeswoman Alison Duquette. (For more information on turbulence, call the FAA's Consumer Hotline at 800-FAA-SURE or visit the FAA Web site at <http://www.faa.gov>.)

I've been on too many bumpy flights to count. It's certainly no fun to try to keep a young child happy in a cramped space for hours at a stretch. I've juggled keys at an infant, read the same book and lost entirely too many games of tic-tac-toe, all the while trying to keep my noisy brood from annoying the childless travelers surrounding us.

Even though government and airline officials now agree approved child-safety restraints (rear-facing ones for infants under 20 pounds) can provide the same lifesaving function in the skies, they won't require parents to use them. And from where I sit, that's a serious problem.

The FAA's response has been to launch a public awareness campaign to "strongly urge" parents to use approved child-safety **seats** on board flights for **children** under 40 pounds. Nothing prevents parents from legally flying without them.

Airlines "strongly recommend" that parents use safety **seats**, but provide a strong incentive to do the opposite -- free airfare, though no guaranteed **seat**, for **children** under 2 years old. Thus, on full or overbooked flights, infants and toddlers end up in the parents' laps unless their parents paid for a seat in advance.

Most parents end up checking their safety seats with the rest of their luggage. I've taken safety seats to the gate only to have the gate agent roll her eyes as if I were dreaming that I was going to get an empty seat to strap it in.

Few parents recognize the value of safety seats in the air. Five babies who died in plane accidents or incidents in the last 18 years could have survived had they been restrained, the FAA reported in a recent study.

The FAA's official line is that mandating the use of safety seats would up the cost of air travel for young families and force more of them to travel by car, auguring 82 additional traffic fatalities over the next decade. Flight attendants, who lobbied hard for a new law, counter that babies are the only item on board planes -- including coffee cups -- that aren't tied down.

But even the heightened public awareness of air safety issues hasn't helped the cause. "We haven't seen a major increase in usage (of child-safety seats) on airplanes," said the flight attendants' spokeswoman Goodman.

How can it, as long as children under 2 may travel free on parents' laps on domestic flights?



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Chicago Sun-Times, March 2, 1997

What can parents do? Write or e-mail your congressman to express your concern. Send another letter to the president of your favorite airline explaining why parents should be encouraged to use child-safety seats, not penalized by having to purchase an extra seat.

Most important, press every parent you know to lug that safety seat to the gate the next time they fly with their baby or toddler. (Tell them if they haven't bought a ticket for their child, the gate agent will give them a seat if it's available.)

It's worth the hassle -- one bumpy patch is all it takes to ruin your trip, or worse.

Eileen Ogintz is the author of "Taking the Kids" travel guides for children on the Pacific Northwest, American Southwest and Northern and Southern California (HarperCollins West, \$ 9.95).

LANGUAGE: English

LOAD-DATE: March 3, 1997



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Travel Weekly

February 17, 1997

SECTION: No. 13, Vol. 56; Pg. 1; ISSN: 0041-2082

IAC-ACC-NO: 19126932

LENGTH: 599 words

HEADLINE: Gore report suggests fees to fund safety; White House Commission on Aviation Safety and Security recommends the use of ticket surcharges to fund aviation security measures

BYLINE: Durbin, Fran

BODY:

WASHINGTON -- Airline passenger might have to pay ticket surcharges to help finance the many enhanced security measures recommended by the White House Commission on Aviation Safety and Security.

The commission recommended that the government come up with \$ 100 million a year to help meet the capital requirements of an improved aviation security system, but it made clear that more money will be needed.

Among the possibilities suggested by the commission were "aviation user security surcharges," local security fees and tax incentives.

Created by President Clinton in July 1996, shortly after the TWA disaster, the commission was headed by Vice President Gore and presented the President with a thick, final report that generally drew praise from the aviation community.

The recommendations touch almost every aspect of aviation, such as exploring the potential threat of surface-to-air missiles and rewriting federal aviation regulations "in plain English."

Highlights are as follows:

* **Airline** passengers would have to buy **seats** for **children** under age 2, who no longer would be allow to sit on an adult's lap.

This suggestion has caused controversy in the past.

Airlines and the Federal Aviation Administration have been reluctant to make passengers gers buy tickets for babies and toddlers, in part because it could make them switch to the automobile for their trips, which is potentially more dangerous, and in part because airlines would lose revenues.



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* Domestic bag-matching, or matching each checked bag with each passenger before takeoff, would be implemented by Dec. 31 for passengers selected at random and those meeting a passenger profiling systems that detects those "who merit additional attention."

This is a retreat from a proposal contained in the commission's initial report last September, which called for full bag-matching for every domestic passenger, proposition that would have been extremely expensive for the airlines and time-consuming for domestic travelers.

The passengers profiling system, according to the commission, could not be based on race, religion or national origin. Nevertheless, it sparked opposition from civil liberties organizations.

The commission made clear that passenger profiling would last only until explosive-detection systems to screen baggage are "reliable and fully deployed" at airports.

At the commission's prodding, the Transportation Department will call for comments early this year on a proposed airlines and travel agents to compile more data on travelers for passenger manifests on domestic flights.

The DOT already has solicited comments on compiling passenger manifest data on international flights, and ASTA has objected to the notion that agents should shoulders any part of the burden.

Tickets taxes would be replaced with user fees, but the fees should not "discriminate" against any segment of the airline industry, according to the commission.

The user-free proposal, already under study by Congress, is supported by big airlines but opposed by smaller carriers.

The FAA would work with the industry to beef up the professionalism of the aviation security workforce, including screening personnel.

Congress would enact legislation to more fully protect aviation employees who report safety and security violations.

Enhance ground proximity warning systems would be installed in all commercial and military passenger aircraft.

The Justice Department would prosecute to the fullest any unruly passenger who interferes with the job of aircraft crews.

LANGUAGE: ENGLISH

IAC-CREATE-DATE: March 5, 1997

LOAD-DATE: March 06, 1997



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February 14, 1997 18:16 Eastern Time

SECTION: NATIONAL DESK

LENGTH: 1929 words

HEADLINE: Transcript of White House Press Briefing by Mike McCurry (6 of 6)

CONTACT: White House Press Office, 202-456-2100

DATELINE: WASHINGTON, Feb. 14

BODY:

Following is a transcript of a White House press briefing held today by Press Secretary Mike McCurry (Part 6 of 6):

Q Mike, when the issue of the New York fundraiser first came up, I believe one of the things you said was it was hard money, but it turns out it's not all hard money. Is there some concern --

MR. MCCURRY: You mean the Tuesday event?

Q The Tuesday event.

MR. MCCURRY: Yes. Originally, we were told originally and erroneously by the Senate Campaign Committee that it was a hard money event. There is some soft money event, and --

Q The President has no problem with that?

MR. MCCURRY: Well, the President has a problem with soft money, but it's going to be raised and it's going to be raised until such raised by both parties, and it will be raised in significant and larger quantities by the Republican Party than by the Democratic Party.

Q He doesn't see a problem when he's claiming to be in favor of a ban on soft money and then going to a fundraiser that raises soft money?

MR. MCCURRY: Look, we've done this question ten different times, ten different days now. I'll tell you, fundraising is going to have to continue in one fashion or another. It will continue right now under the body of law that exists now. We're trying to change that body of law so the rules are changed. But we are also going to have to raise money to remain competitive with the Republican Party. And it would be better to outlaw soft money, it would be better for the Republicans and Democrats to voluntarily agree not to take it, but it will be a factor in our politics until it gets outlawed.

The President would like to see it outlawed, he is going to work -- we're going to work hard to try to raise money in so-called "hard amounts" by building up grass-roots donors, things that some of our folks at the DNC have talked about, but for all practical purposes, that will be an element in the structure of campaign finance until such time as we change the law.



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U.S. Newswire, February 14, 1997

Q Speaking of that, he's talked about this national crusade for education and he's already given several speeches, and I'm assuming many, many more are planned. Why not do the same thing with campaign finance reform?

MR. MCCURRY: We've been -- asked exactly why we did an event with the sponsors this week, we're going to look for other occasions, we've put out a statement in support of the common cause effort to get the signatures yesterday; we'll continue to do the same with that, too.

Q Will he go out and actually give a whole speech devoted to it?

MR. MCCURRY: I wouldn't rule out the possibility he might do that some time.

Q What, if anything, can you tell us about the President's interest in child safety restraints and how he feels?

MR. MCCURRY: I can say the President has watched very carefully -- (laughter) -- and thank you for that enlightenment. You never know who might be listening to one of those phone calls. The President has followed very closely some of the debate about how to make it easier for parents to protect their children when writing -- you're ruining the sound bite I'm trying to give this guy. Why don't you just turn the thing off. (Laughter.)

Q Three, two, one --

MR. MCCURRY: Three, two one -- what was I saying? (Laughter.)

Q Well, I guess we'll never get that one again. That's gone for good.

MR. MCCURRY: The President has followed very closely some of the efforts to protect America's children when riding in automobiles from the inappropriate -- that's not right -- let's try it over. Take two. (Laughter.) It's too long anyway. You never cut this thing.

Q Is there anything about the current situation --

MR. MCCURRY: Ask me. (Laughter.) Look, here's the problem. Here's the problem. I'll speak from personal experience. The problem with car seats is that they -- you never know how to get the little thingy in through the back and get it stuck into the little deal that goes in the side. (Laughter.) And then you have to take it out. And you never know whether it's plugged in or not. And then your kid goes flying over when you go turning too fast to the right. (Laughter.) And you know, everything goes over and the juice bottle goes all over the place. And it's a mess. (Laughter.) So we're going to fix it. (Laughter.)

Let's try that again. (Laughter.)

Q This is even more disruptive than an American **Airline's** strike.

Q So a tax credit is the answer, is that it?

MR. MCCURRY: No, let's try that again. (Laughter.) There are different designs in cars and different designs in car **seats** that make it confusing for parents sometimes to figure out how to get **children** properly situated when they go out to drive. There have been some efforts made at the Transportation Department to look how we can make it easier for parents to protect their kids when they're driving. And the President's going to have some more to say about a way that they've come to some conclusions about the best way to do that.



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Q That was longer than the radio address. (Laughter.)

MR. MCCURRY: Is the radio address done yet? It ought to be available. All right.

Q Speaking of the radio address --

Q That's what it's about.

MR. MCCURRY: What else have we got coming up?

Q That's what it's going to be?

MR. MCCURRY: We'll keep you -- look, we will keep you apprised as to what we know, if anything, about what's going on.

Q Week ahead?

Q Week ahead?

MR. MCCURRY: Week ahead.

Q Monday, Tuesday?

MR. MCCURRY: The week ahead is Tuesday -- the only thing I have at this point is Tuesday, you know of our event in New York with the Business Enterprise Trust. You obviously know a fair amount about the fundraiser. We're going off to Boston. The event is still a juvenile crime event, but I don't have the final details on that.

We expect throughout the balance of week some important events related to -- what?

MS. GLYNN: A couple of other events on --

MR. MCCURRY: What?

MS. GLYNN: On many different issues.

MR. MCCURRY: Is that all we have at this point?

MS. GLYNN: That's all we've got at this point. We'll put out a detailed schedule for Tuesday, Wednesday later this weekend.

MR. MCCURRY: Okay. We don't have many details beyond that. Oh what news, late-breaking.

Q Access tonight after 10:30 p.m. -- can we get that established?

MR. MCCURRY: We did all everything on that. I won't speculate on that. I think our plans are to go home and if that's changed, we'll let you know.

Q Is the charter on Tuesday American Airlines? (Laughter.) Just wondering.

Q She means can people get into the White House if they have to.

Q Mike, for those doing stand-ups -- they lock the doors at 10:30 p.m.

MR. MCCURRY: Yes, we'll talk to them about that.

THE PRESS: Thank you.

MR. MCCURRY: It's always a pleasure.

END 2:51 P.M. EST

LANGUAGE: ENGLISH

LOAD-DATE: February 14, 1997



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February 12, 1997 18:40 Eastern Time

SECTION: NATIONAL DESK

LENGTH: 2733 words

HEADLINE: Transcript of White House Press Briefing by McCurry and Kamarck 2 of 6)

CONTACT: White House Press Office, 202-456-2100

DATELINE: WASHINGTON, Feb. 12

BODY:

Following is a transcript of a White House press briefing by Mike McCurry and Dr. Elaine Kamarck (2 of 6):

Q Page 15, you recommend that **children** under two be given some child restraint system. Will that require passengers to buy a **seat** on planes for infants and **children** under two?

DR. KAMARCK: Yes. The **airlines**, of course, will figure that out. We hope that the market will work and they'll be creative. But, yes, that's what probably will happen.

Q You recommend profiling, but at the same time you hedge it with all kinds of precautions against stereotyping national origin, et cetera. If you're that concerned about the civil liberties impact, what is left as criteria for the people on the front lines who are going to have to make profiling decisions other than random selection of passengers?

DR. KAMARCK: The profiling systems that are being designed and are used -- and being used are primarily behavioral in their design, as opposed to using national origin or race as a criterion. And those behavioral aspects, obviously, we don't talk about in public. And therefore, when the civil liberties panel went through their concerns about a profiling system, we felt that we could meet most of them and still have an effective profiling system.

Again, profiling, bag match -- all these things only work in conjunction, in the context of a comprehensive security system. It's just one piece.

Q Can you put in plain English what you mean by "behavioral"?

DR. KAMARCK: No, I cannot because --

Q It's just left us a mystery as to what criteria, if any, are going to be used in profiling.

DR. KAMARCK: Yes, we do leave that a mystery for -- yes, for pretty



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U.S. Newswire, February 12, 1997

good reasons, too.

Q Are you simply saying, we'll tell you what we're not going to use --

DR. KAMARCK: Right. We are not going to -- that's right, for obvious reasons.

Q Can you take me through the process by which you reached the conclusion on antimissile defense systems? Did you consult with DOD? Was this a controversial discussion?

DR. KAMARCK: It was -- no, it was not -- the antimissile defense systems was not a controversial item within the commission at any point in time. There was early drafting that everyone disagreed with and thought went way too far and was much too strong and was out of proportion to the actual threat. The facts are that 31 airplanes have been shot down by surface-to-air missiles. Those have all occurred in war zones. They've all occurred in Africa, Beirut, places like that where there's a war going on. They have not occurred in a place where there's not a war.

Nevertheless, the government of the United States does spend a lot of time planning for things that don't happen very often, or hopefully, never happen. And so the thought was that, given that we do know that terrorist groups try to get these missiles, et cetera, that we should have an interagency plan ready in case at some point in the future we think this is a bigger threat than it is now. That's all that recommendation is about. It should not alarm anyone. It's just prudent planning on the part of the government.

Q I've heard some complaints in the last week since the budget came out from the airport executives, that actually there was less money initiative he budget than there was last year for the aviation trust fund. Can you clear that up for me? I'm not really sure -- because they seem to be upset that there was --

DR. KAMARCK: No, I haven't heard that. And what you probably should do, is a question like that Larry Haas can find it out from OMB later today.

Q How do you think this bag matching is going to end up? How's it going to be reconciled with the airline's concerns about how bag matching is going to jam up hubs?

DR. KAMARCK: I think that basically technology will eventually solve the problem, and the question is how fast does the government mandate it. We took an interim position today because there are a lot of problems with the hubs, because the connection times at the hubs are so short -- so we took an interim position of partial bag match until we can get to full bag match.

We don't know some critical pieces of information yet about bag match. We don't know the number of people who voluntarily don't board a connecting flight, and their bags go ahead, but they don't. We don't know that number. Until we have better data, which we will have in May, it will be harder for us to make a rule on it. But our intent is, in fact, to have the most secure

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U.S. Newswire, February 12, 1997

system possible, to get there, get to full bag match, but to begin with the proposal that's laid out in the report today.

Q Back to the behavioral profiling question. Are you suggesting specific behavior which will be suspect and subject to

DR. KAMARCK: There's a system being developed with Northwest Airlines and with the FAA, and they are looking at specific kinds of behavior. As with profiling, which Customs routinely does to catch drug smugglers, the behaviors also change constantly and are also constantly checked by random checking. So this is an ongoing process that's always changing as the people who are trying to do bad things are changing.

Q Another bag match question. In the short-term, how do you implement partial or random bag match? How does that work?

DR. KAMARCK: By using a profiling system in conjunction with the bag match.

Q But the bags are already in the hold.

DR. KAMARCK: You will pull the bags, based on your profiling system.

Q Before they go into the hold?

DR. KAMARCK: Either before they go into the hold -- well, pulling them before they go in the hold is no problem. It's when do you -- the real question comes down to, do you delay a flight to pull the bag, okay. And that's where we will use a profiling system in conjunction with bag match.

Q How do you access them? How do you know where the bag is, or is that information --

DR. KAMARCK: This is why technology is going to eventually solve this. Some airlines have very sophisticated computer-coded bar codes on the baggage tags that match the ticket, and then they literally sort the compartments, their cargo holds, by the bar codes. So some airlines already have the technology where it doesn't take them long to do this, they can instantly find that bag and pull it.

And, of course, the cargo planes, like Federal Express and those shippers, they know exactly where everything is at every point in their holds. More and more airlines are moving towards this technology. The faster they get to the technology, then the easier and the less disruption to the current system this is going to be.

Q It says that you're deploying 140 inspectors, Customs inspectors to critical airports. How many critical airports are there? Which airports are critical airports?

DR. KAMARCK: Category X airports -- there's 19 category X airports, those are critical airports.

Q Who knows which ones they are?

DR. KAMARCK: Do we say which ones they are?

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U.S. Newswire, February 12, 1997

DR. KAUVAR: I don't have a list. They're places like Kennedy, Miami, Los Angeles, San Francisco --

Q Miami, Philadelphia, Detroit, Charlotte?

DR. KAMARCK: Big ones.

Q What about this recommendation on mail that any package or envelope that weighs over one pound, somebody would have to go to the post office and sign a statement to mail anything over one pound?

DR. KAMARCK: Yes, you would sign a release that this can be expected, so that if somebody at the post office finds that it is suspect, okay -- it's ticking, for instance -- they have the right to open it up and make sure that it doesn't go on an airplane.

Q And they don't now? If it's ticking, they can't open it? Is that what you're saying?

DR. KAMARCK: Actually, they do now. The post office just started to do this.

Thank you.

MR. MCCURRY: Any other subjects du jour?

Q -- Cuba?

MR. MCCURRY: Want me to do that up top?

I'm going to take Helen's first question. Let me start by saying that the administration today has approved licenses to 10 major U.S. media organizations to open news bureaus in Cuba. This action is in keeping with the policy stated by the President in October of 1995 of supporting an increased flow of accurate information to and from and within Cuba itself. The administration believes that news gathering and reporting by U.S. news organizations will keep international attention focused on the situation in Cuba and the realities of economic and political conditions there and will bring greater public exposure to those who are advocating a democratic change in Cuba.

All qualified U.S. news organizations that have applied to the Treasury Department to the Office of Foreign Assets Control for licenses have been granted those licenses. Those news organizations are CNN, ABC, CBS, the Miami Herald, Dow Jones, the School for Advanced International Studies at Johns Hopkins, which publishes a Cuba newsletter, Unavision, the Chicago Tribune, the Sun-Sentinel of South Florida, and the Associated Press. To our knowledge at this point, only one organization, CNN, has already received permission from the government of Cuba to establish an office in Cuba. We hope other news organizations will soon be allowed to have a presence in Cuba.

The licenses issued today are valid for one year. They authorize all transactions directly related to the establishment and operation of news offices within Cuba. They also stipulate that U.S. media require that their news gathering activities within Cuba be unconditioned and unrestricted -- a stipulation that I believe all the news organizations involved seeking licenses would quickly say would be part of their journalistic responsibility.

Happy to make that announcement.

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